

JUNE 1958

VOL. 20 NO. 7

MINING WORLD



Mt. Copper Mines Pyrite With
8:1 Stripping Ratio Page 40

DMEA Exploration Finds Ore
At American Zinc Page 50



Why Western Mines Use Steel Sets

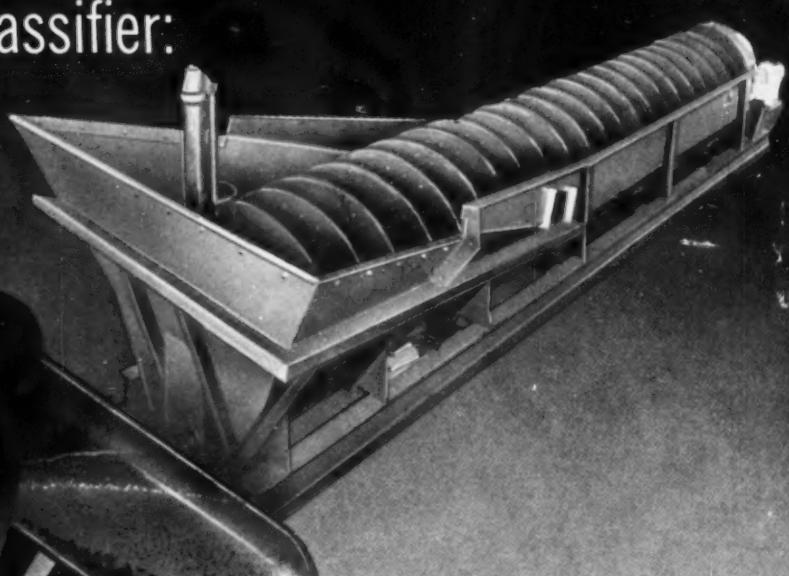
Page 47

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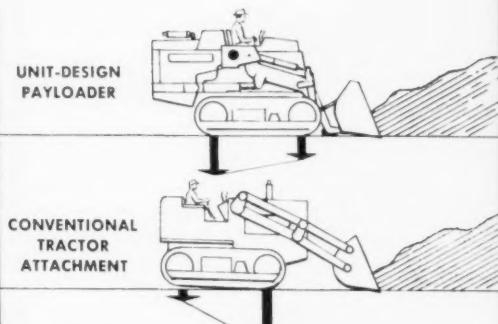
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VOLUME 20

JUNE 1958

No. 7

OPERATIONS—TECHNOLOGY

Open Pit Mining

Mountain Copper Converts Underground Mining to Open Pit . . . 40

By STANLEY H. DAYTON

A new open pit was developed to replace induced caving operations and is expected to yield a better extraction of the ore at the Iron Mountain California property. Open pit requires an 8 to 1 stripping ratio, but it gives comparable costs to underground stoping.

Exploration

American Zinc's Tennessee DMEA Program 50

By CHARLES R. L. ODER

In Eastern Tennessee American Zinc Company of Tennessee has completed a DMEA exploration program to develop 35,000,000 tons of minable zinc ore. Surface drilling also yielded valuable geological information upon which to base further exploration.

Underground Mining

Why Yieldable Arch Steel Sets Save Money in Heavy Ground . . . 47

By G. M. HUCK

Western Miners are using yieldable steel sets in heavy ground to save money and increase ventilation. Correct installation is key to proper use of set so above ground training sets are used to teach installation techniques.

Soviet's Sink Shafts Swiftly with Mechanized Equipment 54

By GEORGE ROSU

The Soviets have mechanized for fast shaft sinking by adopting many methods and copying equipment used by the West. However, the Soviets have done more experimentation and have designed at a faster rate radical equipment for shaft sinking than has the West.

Geology

How to Speed Geological Map Drafting 57

By G. W. IRWIN

A special set of rubber stamps when used with carefully designed and printed map paper speeds mine geologists routine map drafting. You, too, can have these stamps made for your mine.

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ON THE COVER

Bethlehem yieldable steel arch sets in a slusher drift in a Western copper mine. While initial cost is higher than timber, maintenance is lower and steel sets have much higher salvage value.



MILLER FREEMAN PUBLICATIONS



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eye-bolt, or clevis attachments.

Write for FREE Bulletin 46-8

Right off the -Wire

A computer-controller system is said to be capable of landing 120 jet planes per hour. Human control can average no better than 40 per hour.



Dockside facilities at SIMPLEX' Submarine Cable Division in Newington, N. H. are extensive enough to continuously load two of the largest submarine cable ships simultaneously.



A new plant is reported to cut the manufacturing time of industrial carbon components from eight weeks to eight minutes.



A "building block" technique, using miniature plug-in units, makes it possible to build an electronic computer small enough to go on an office desk.



An iron-aluminum alloy has been made, the behavior of which indicates that there is a relationship between rusting and magnetism.



Some fruit trees have been found to ripen earlier after long exposure to gamma radiation.



At least one of the new "exotic" rocket fuels is being made in solid form and others are expected soon.



A patent has been issued for a radioactive "go-devil" (a device for cleaning pipe lines). If it sticks in a pipe it can be located with a Geiger counter.



It is estimated that malicious damage to street lamps costs New York City a quarter of a million dollars a year. A new plexiglas globe makes this sort of vandalism almost impossible.



Instead of the usual bracing and shoring, inflatable cushions are being used to wedge freight tightly in box cars.

One of the new guided missiles is launched from an automatic base which computes the location of the attacking object, calculates its speed and the proper point for meeting it. It also loads and fires the missile automatically.



A micro-porous synthetic material holds a liquid, such as an ink or lubricant, and gives it off at a controlled rate.



Damage to small delicate parts on a conveyor can be avoided by a new belt that uses permanent magnets to hold the pieces apart.



Glass-reinforced plastics can be strengthened by the use of a special new glass containing copper oxide.



Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.



A new wool-like synthetic fiber is water-repellent, quick-drying and less expensive than other synthetics.



A device for measuring the power output of a turbine involves an inner and an outer gear in constant mesh with free space between the teeth. This space is filled with oil on which the pressure can be measured.



Simplex Wire & Cable Co. was the first to adapt interlocked armor (CONDEX) for use with underground cable in 1924.



A logging company is using plastic nails to fasten logs together. They neither rust nor damage saw blades.



Paralyzed fingers can be made to move by means of tiny artificial muscles powered by a carbon dioxide cartridge.

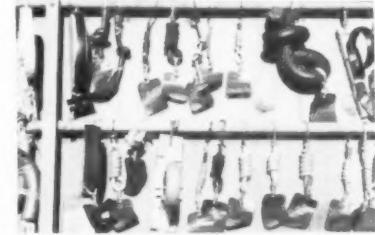
Research conducted by two Simplex scientists in the early 1920's resulted in the first truly moisture-resistant rubber insulation. The isolation and removal of the proteins that are always present in natural rubber was the basis of the now famous ANHYDREX family of insulations.



Foamed aluminum is being made for use as a core in sandwich construction.



An electronic device checks the accuracy of aircraft guns without firing them.



Rooftop Laboratory

These cable samples, twisted and bent to exert maximum stress on insulations and jackets, are undergoing sun-crack endurance tests atop the Simplex plant at Cambridge. Many of these samples have been exposed to the elements for as long as fifteen years . . . and they haven't cracked yet. This is one example of the many punishing tests which Simplex insulating and jacketing compounds, such as Anhydrex, Thermoplex and polyethylene, are subjected to before they win final approval.

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MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

You Too Can Back the DMEA

MINING WORLD had the opportunity in the May 1958 issue to review the fine work that the Defense Minerals Exploration Administration has done in cooperating with the domestic mining industry—large, small, and gigantic individuals and corporations—in exploring for domestic ore bodies. Results have been good and the discovery rate and potential grows in scope and importance every day.

The result of only one DMEA program—35,000,000 tons of zinc ore in Tennessee—is outlined in this issue. There have been many other equally impressive discoveries.

The mining industry has an important task. Get behind the DMEA, make it permanent by Congressional action. Write today to Interior Secretary Seaton, write today to your Senators and Congressmen, and have your staff and associates write demanding continuance of DMEA.

Tax Advantage in Canada

With the exception of British Columbia, the Canadian taxes on the mining industry are more favorable than in the United States. This is particularly true for new mining ventures where the investors have at least a chance to regain their money during the first three years of operation.

Taxes paid by established operating mines in Canada are lower, too. This is dramatically illustrated in the current annual reports of Pend Oreille Mines & Metals Company, operating in the Metalline Falls district of Washington, and the Reeves MacDonald Mines Limited, operating in British Columbia, Canada only a few miles north. Both firms are mining similar grade ore from geologically similar deposits. Both mines and mills are magnificently equipped to achieve low costs. Both mines have keen and experienced engineering and management. Not surprisingly costs for 1957 are very similar despite the fact that Pend Oreille treated almost double the tonnage. The major operating cost difference was in development at Pend Oreille.

Relative rate of taxes figured as an operating cost, however, were completely different. In the United States, they were \$0.175 per ton on 757,197 tons; in Canada, only \$0.034 per ton on 405,531 tons.

Thanks To Blue Ribbon Judges

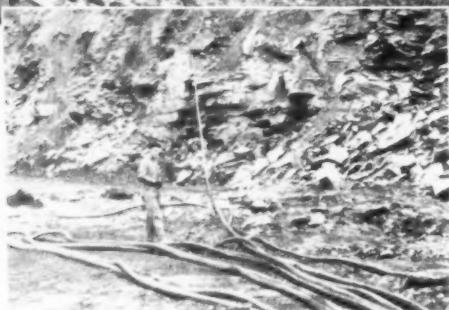
Today's cost cutting era welcomes new equipment developments. And the new equipment that received Mining World's Blue Ribbon certificates in the April 15th issue already has attracted worldwide interest by operators and manufacturers.

Here are a few samples of thanks to the judges for their time and study: "We hope that the award will be followed by a quality of service to the mining industry which will rate as high as the design itself"; "We'd like to thank the members of the panel of judges"; "It is amazing how much of a 'lift' the certificate gives not only to our people in sales but also to the folks at the mill"; "I certainly thank you and the judging committee for this honor."

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MINING WORLD NEWSLETTER

Round Mountain . . . Garfield . . . Tel Aviv

June 1958

British Columbia celebrates two important centennial events this year. One Hundred Years Ago, the mainland Colony of British Columbia was proclaimed at Fort Langley, and the discovery of the fabulous Fraser gold fields brought the gold rush of 1858.

The current increasing interest in gold makes the Festival especially timely. Gold has been out of the limelight because of the rising cost of operations, coupled with a stable selling price; however, as always in a time of a slow economy, gold again is taking on popular favor.

Canadian gold production was up in 1957, over 1956, due mainly to government support, and the Canadian government has extended federal subsidies to mines until December 31, 1960. Some 80 percent of the Dominion's gold output comes directly from gold mines; the other 20 percent is a byproduct of non-ferrous mines.

The ills of the U.S. gold mining industry may soon be studied by a joint Congressional committee which would hold hearings in the field. Recommendations for alleviation will then be made to Congress.

Meanwhile, gold continues to attract interest.

Round Mountain Gold Dredging Corporation has started milling at its Nevada property. The remodeled mill has a planned capacity of 250,000 cubic yards monthly.

The Osceola district in White Pine County, Nevada is showing renewed activity.

Alaskan gold miners have returned for the 1958 season, hopeful that they will have adequate water this year.

Private uranium sales are now authorized to domestic and foreign buyers for peaceful uses of atomic energy. Of course, all sales will be licensed by the AEC.

18 uranium mills now in operation and those being built or planned will provide sufficient concentrate to meet AEC needs for next few years, says Commission, and also supply commercial demands as U.S. industry establishes new outlets.

Joint application for a new milling contract has been made to the AEC by United Western Minerals and Golden Cycle Corporation. The two firms would then construct additional facilities at the Carlton mill in the Cripple Creek area of Colorado to process Front Range uranium ores.

Adversely affecting some uranium operations, however, is the low copper price.

Not enough vital acid is being produced by Garfield Chemical & Manufacturing Corporation, for example. Garfield uses roaster gas from ASARCO's smelter at Garfield, Utah as its sulphur source. With Kennecott's cutback at its Utah division, there isn't enough concentrate for the smelter which, in turn, supplies gas to Garfield.

Shipments of high-lime uranium ores are being curtailed so that mills can minimize high-cost imports of eastern or Gulf Coast acid.

Nuggets of news as we went to press:

Construction of a \$1,000,000 molybdenum plant at Coldwater, Michigan will be undertaken by Climax Molybdenum Company, division of American Metal Climax, Inc.

A barite deposit is being diamond drilled near Van Lake in eastern Turkey.

A Mexican sulphur dome, discovered in the Papaloapan Valley between Tlacotalpan and Cosomaloapan, on the Gulf of Mexico, will be developed by a new firm.

Unconfirmed rumors indicate some Orange Free State mine shafts and headframes in Union of South Africa have shifted out of line because of ground movement.

Israeli government is negotiating with several European mining firms for joint exploration and possible development of recently discovered phosphate deposits. The Italian firm of Montecatini is reported to be considering investing half of sum needed for commercial development of these deposits.

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Capitol Concentrates

Secretary Seaton Proposes Five-Year Plan To Subsidize Cu, Pb, Zn, CaF₂, and WO₃

The new "Brannan" plan for minerals proposed by Secretary of the Interior Seaton to support prices for copper, lead, zinc, acid-grade fluorspar, and tungsten came as a complete shock to the industries involved.

The immediate reaction was that all the support prices in the plan are set too low to produce the quantities stated in the annual limitation, just as the production bonuses in Seaton's chrome and beryl programs of last year were too low to keep the mines in operation. In the case of copper, the support price is below the peril point industry claims it must have, and in the case of lead and zinc, considerably below the figures proposed previously by Seaton himself, a curious case of inconsistency yet to be resolved. His fluorspar support price is below the figure he approved in P.L. 733, as is the tungsten price. In fact the \$36.00 per unit proposed for tungsten borders on the absurd, as did his \$21.00 per ton bonus for domestic chrome last year.

The Secretary now has endorsed subsidies for minerals as being the Administration line rather than tariffs or quotas or both. The copper, lead, and zinc industries seem to be uniformly opposed to such an approach.

Secretary Seaton's plan for minerals appears to have some bad flaws in it, according to the experts. For example:

1. It may violate GATT as badly as tariffs or quotas. Internal subsidies are frowned upon and probably will have to be the subject of negotiations with other producing nations, according to some authorities.

2. Across-the-board subsidies frequently have been anathema with some Congressmen on the basis that they may give windfalls to low-cost operators.

3. If the support or "stabilization" prices are such as not to furnish low-cost operators with windfalls, they may be low enough to rule out high-cost operators.

4. The plan may tend to depress prices on the open market. Domestic producers could well lower their prices to get the edge on foreign producers since the subsidized companies would have nothing to lose. This may cause strong resistance to the plan among foreign governments.

5. Proper allocation of the quantity limitations may pose some tough administrative problems. Almost any system of allocation between producers is apt to cause controversy and bitterness.

6. If it does depress prices, the \$161,090,000 appropriation requested for the first year may grow to astronomical figures and only increased consumption and lowered production would reverse the trend.

7. The quantities and prices are fixed. There is (unless Seaton comes up with some variation of his first announcement) no mechanism to increase the "annual limitation" with the normal increase in consumption which might be expected with a projection

of population growth. No provision is made to increase the "stabilization" prices in accordance with increases in mining costs. If some escalation formula is not included, prices which might be satisfactory now (and there is much testimony to the effect that Seaton's prices are all too low) very likely will not be valid five years from now (the life of the proposed plan), or even for a shorter period.

Seaton warned the Senate Interior Committee and the Congress not to expect approval of any other type of legislation or escape-clause relief by saying, "The plan to which I refer has the endorsement of the President who believes it to be the best way of solving the problems which confront us." However, his proposal appears to have generated few, if any, friends.

● DMEA Program Is In Jeopardy

Office of Defense Mobilization Director Gordon Gray has announced that he will discontinue the Defense Minerals Exploration Administration on June 30, 1958. Secretary of the Interior Fred Seaton has asked the Senate Interior Committee to take quick action on a bill to extend the agency by law so there will be no lapse in its functions.

Informed sources indicate the Congress may take action on the bill this session, but that there will have to be modifications of the bill drafted by the Interior Department. The major objections are to the so-called "paupers oath" section which would make a company certify that it has no other source of development funds.

● Mine-Mill Endorses Mine Legislation

Officials of the International Union of Mine, Mill and Smelter Workers testified before the Senate Interior subcommittee on Minerals, Materials and Fuels that their preference of methods to cure the ills of the mining industry and set up a genuine, long-range program would be S. 2395 by Senator James E. Murray of Montana. They asked, however, that the bill be "amended so as to extend its benefits to copper, and to set limits on the amount of total production of each metal that would be eligible for a production bonus and on the amount to be paid to any one operator." This bill, they said, would be suitable for more minerals than lead and zinc, and would keep the mines running, keep down the price spiral (which is important to labor), and cost much less than direct purchases by the government.

● Seamed Flasks Are Acceptable

Seamed flasks will be acceptable for mercury delivered to the General Services Administration under the domestic mercury purchase program, GSA has announced.

Mercury producers had protested previous regulations in regard to the type of flasks required. They maintained that the specifications were much too stringent and called for a more expensive flask than the one in common usage at the time the program

was established. Because of the controversy, GSA awarded a research contract to Stanford Research Institute to test and develop specifications for an acceptable flask in which the mercury could be stored without leakage. The study was completed in March and seamed flasks received the approval of the Stanford organization. Therefore, they are now acceptable to GSA.

The packaging difficulty had caused GSA to extend the delivery date for 1957 mercury deliveries until March 31, 1958. The additional deliveries made during the period have not been figured, as yet, into the total purchases for 1957. The mercury program for 1958 calls for the acquisition of 50,000 flasks of mercury with 30,000 from domestic sources and 20,000 from Mexico at a guaranteed price of \$225.00 per flask.

• Secretary Rejects New Manganese Programs

When referring to domestic manganese, Interior Secretary Seaton said: "Now that our minimum stockpile objective has been met, the urgency of a low-grade manganese ore purchase program cannot be justified on the basis of defense needs. We do not foresee that continuing a program or initiating new programs to encourage the mining of these low-grade, presently noncommercial ores, will lead to a worthwhile objective."

As the carlot program encourages mining low-grade ores, the Secretary of the Interior presents a bleak picture to the domestic manganese miner.

• Hayden's Skill Protected Asbestos Program

When the appropriations bill for the Interior Department came before the Senate on April 30, 1958,

it contained provision for an appropriation of \$2,318,000 to continue the fluorspar purchase program until December 31, 1958, the legal termination date of the program under Public Law 733. There also was included a provision to continue available until the same date the unobligated balance of the asbestos appropriation which normally would have reverted to the Treasury on June 30, 1958.

With his usual perverseness where mineral appropriations are concerned, Senator Williams managed to knock this provision on a point of order. With his usual mental nimbleness and knowledge of procedures, Appropriations Chairman Carl Hayden of Arizona sent to the desk an amendment calling for an appropriation for both of \$3,200,000 and got it passed immediately. As the unexpended asbestos balance would have been \$850,000, this was a net gain of \$32,000!

• What Is Long-Range About The Program?

Just what is long-range about the new Seaton mineral "stabilization" program? As the miners see it, the plan is just for five years, subject to cancellation any year at the pleasure of the House and Senate Appropriations Committees, in whole or in part, even though the authorizing legislation is passed. Look what happened to tungsten in Public Law 733! And does the Secretary think that he can get an appropriation for tungsten by Representative Kirwan, even at a "stabilization" price of \$36 per short ton unit? This is a proposal for the benefit of a small handful of large tungsten producers and Kirwan will be among the first to discover it. But, if the Seaton plan will work at all, a few domestic tungsten producers are better than none at all!

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ENGINEER'S FIELD REPORT

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Nevada-Massachusetts Co., operators of one of the world's largest tungsten mines, has relied on Chevron Vistac Oil for 15 years, to keep their rock drills and other air tools operating at peak efficiency. "We use Vistac because it stays on the tools whether they're wet or dry. Doesn't create drag, either...we get full power with minimum tool wear," says general manager Eldridge Nash. Oil's tough, protective film resists high operating temperatures, helps this firm's rock drills (above) bore fifteen 2½-inch blasting holes averaging twelve feet in depth, in just eight hours. Nevada-Mass. does extensive underground mining at this site as well as surface operations.

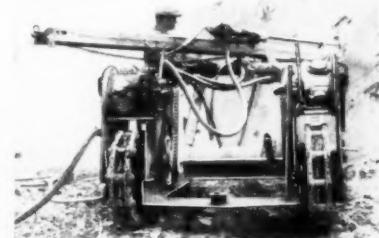


STANDARD OIL COMPANY OF CALIFORNIA,
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY,
P. O. Box 780 • Denver 1, Colorado

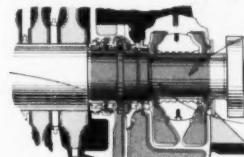
STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

Despite heavy abrasive dust from drilling in Hornfels and Scheelite, (above), Chevron Vistac Oil keeps rock drills working smoothly. Lubricant is used in 60 rock drills, 3 wagon drills, plus 25 tuggers (air motors) on hoist equipment, loaders, slusher hoists and sump pumps.



Special wagon drill, built at mine, uses Ingersoll Rand DA 35 rock drill to bore horizontal holes up to 18 ft. deep. EIMCO air motors lubricated with Chevron Vistac Oil power tracks for fast and easy maneuvering.

Why Chevron Vistac Oil cuts costs in air-tool equipment



• Atomizes quickly and completely—carries evenly over all parts. Prevents excessive fogging and has no unpleasant odor.

• Additives help form tenacious, oily, pressure-resistant film in wet or dry conditions—cuts wear and power loss.

• Resists high temperatures and oxidation. Stays fluid at low temperatures.

For More Information on this or other petroleum products, or the name of your nearest distributor, write or call any company listed.

AT CONSUMERS COMPANY'S QUARRY

P&H ELECTRICS PROVE

In the 100-ft. deep mammoth Consumers Company limestone quarry in McCook, Illinois, this 5 cu. yd. P&H Electric Shovel is proving to be a vital link in the production of crushed stone. This P&H Model 1500 loads a steady stream of 15-ton trucks to keep crushers operating 'round-the-clock.

This maximum availability coupled with a minimum of maintenance is typical of P&H performance in important mines and quarries throughout the world. That's why leading operators are choosing P&H Electrics for both new installations and replacements.

Comparison tests have proved that two exclusive P&H features pay off in *continuous profitable production*:

MAGNETORQUE, the electro-magnetic type coupling that transmits power from hoist motor to dipper for faster action, greatly reducing shock and impact to the hoist gear train and motor.

ELECTRONIC CONTROLS, the fastest acting type of control available on electric shovels, providing the smoothest, quickest production cycle known.

With P&H you get single source responsibility . . . another distinct advantage experienced only by users of P&H Electric Shovels. P&H designs, manufactures and applies all electric rotating equipment specifically for electric shovel service.

P&H ELECTRIC SHOVEL LINE: 3½ through 10 cu. yd. capacities

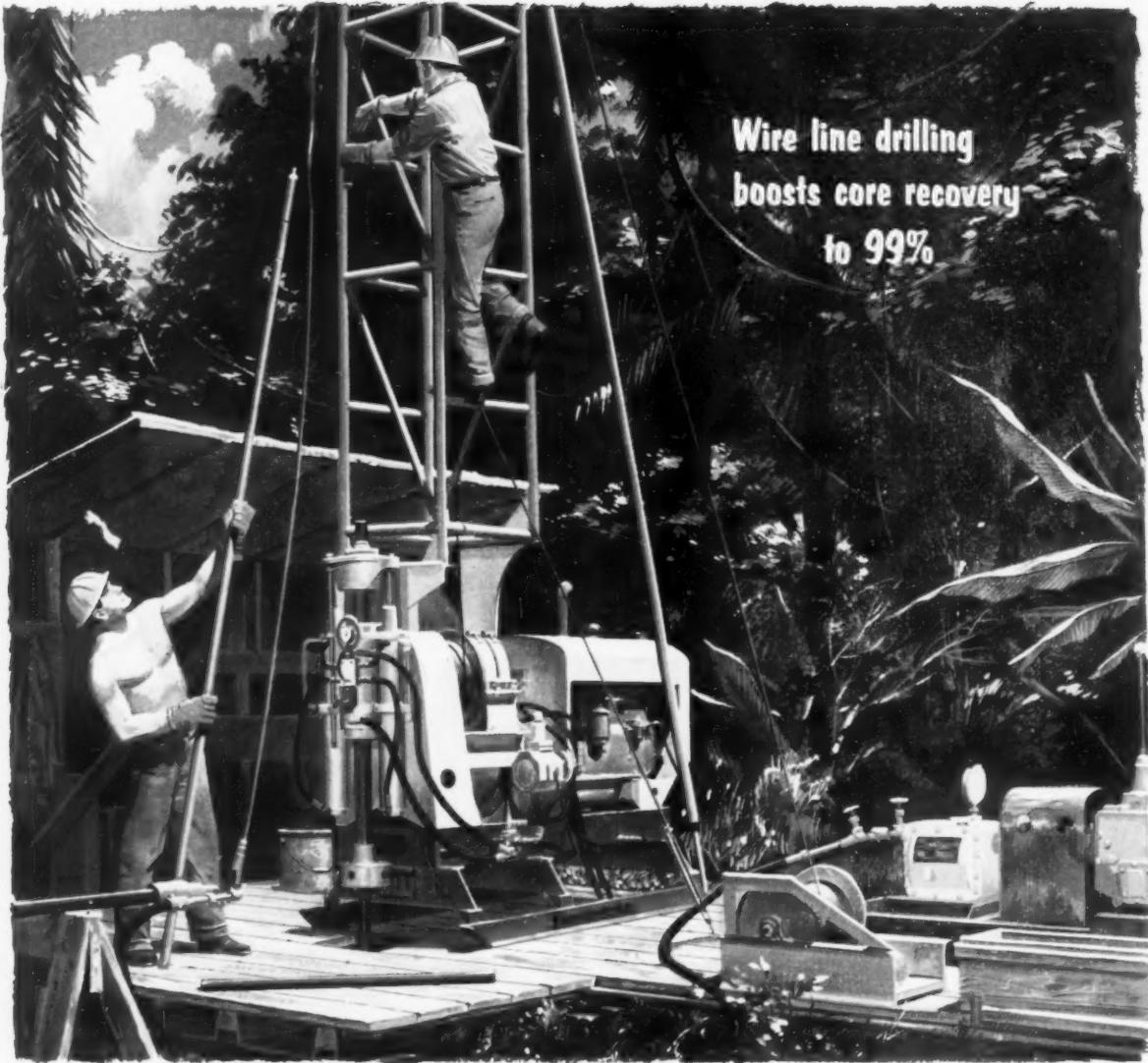
Construction & Mining Division
Milwaukee 46, Wisconsin



THEIR RUGGEDNESS IN ROCK



Report from the field...



Wire line drilling
boosts core recovery
to 99%

31' Per Shift through Broken Limestone and Chert

During a recent exploration, the first 95 feet of one hole were drilled with conventional BX and NX tools. Core recovery was a low 35%. At 95 feet the driller switched to Longyear BX Wire Line. Core recovery for the remaining 1340 feet of the hole was 99%. In fact, in 733,000 feet of Wire Line Drilling in 21 states, core recovery has averaged 94.5%.

In ground that blocks frequently, drillers using conventional equipment are reluctant to pull hundreds or thousands of feet of rods for every 2 or 3 feet of core. Instead, they often drill through the blocks.

In contrast, drillers using Longyear Wire Line can recover the blocked core easily, and will do as often

as necessary. Thus, with Wire Line, drillers obtain maximum core recovery while the drill rods remain in the hole acting as casing. In fact, drilling often progresses for hundreds of feet before it is necessary to pull rods to replace the bit.

To learn how Longyear Wire Line Drilling, functioning as part of Longyear Coordinated Systems, can save you time and money, write for *Longyear World #4* today, E. J. Longyear Company, Minneapolis 2, Minnesota.

E. J. LONGYEAR COMPANY

76 South 8th Street • Minneapolis 2, Minnesota
CANADIAN LONGYEAR, LTD., NORTH BAY, ONT.
LONGYEAR, N.V., THE HAGUE, HOLLAND
LONGYEAR ET CIE., PARIS, FRANCE



THE WORLD IS OUR WORKSHOP

Diamond Core Drill Manufacturers • Core Drilling Contractors
Mining Engineering and Geological Consultants



95 PAYHAULER® FLEET speeds load-delivery 50%

...for Central Pa. Quarry, Stripping, and Construction Co., Hazelton, Pa.

Relocating 1.9 miles of U.S. 40, east of Flintstone, Maryland, Central Pennsylvania Quarry, Stripping, and Construction Co. is moving 1,200,000 cu. yd.—90% of it rock—with five International 95 Payhaulers!

The terrain requires the deepest cut (146 feet), and highest fill (150 feet), in Maryland. The haul is 4,000 feet, with dangerous downgrades exceeding 25%.

Their Payhauler fleet is operating beside competitive haulers down the same steep haul-road. This permits accurate ton-for-ton, and penny-for-penny performance comparisons.

"**Operators particularly like '95' operating ease, riding comfort, and maneuverability**," states Job Superintendent Smith. No wonder! Controls are conveniently located. Modern power steering reduces muscle strain! Shock-swallowing seat gives "club car" riding ease!



Here's what Job Supt. Harry G. Smith reports:

"Delivery time halved"

"The '95's have cut costs of hauling large payloads because Torqmatic braking has cut delivery time in half over the other machines." A fully-loaded Payhauler can go down the steep grades much faster than a conventionally-braked hauler. With complete safety, too!

See how Torqmatic braking gives positive load control at any practical speed—on any grade. Try "95" get-away and climb-out speed, with the wallop of 335 turbocharged diesel "horses." Measure planetary drive axle shock-absorbing advantages. Prove production-boosting Payhauler operating ease. See your International Construction Equipment Distributor for a demonstration!



International® Construction Equipment

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

NOW! A

REMOVABLE

AIR-LEG BIT

THAT'S

ONE-PIECE STRONG

IT'S removable—yet the new Timken® tapered socket bit for air-leg drills is one-piece strong. With this tapered union, you get all the advantages of removability, and the strength of one-piece steel.

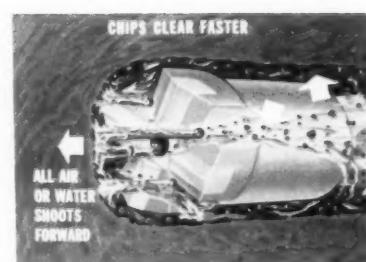
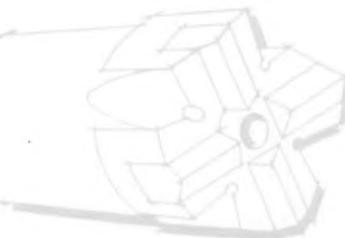
Removability of the new Timken tapered socket bit gives you all these advantages you can't get with intraset steels:

1) No need to throw away good drill steel when the carbides wear out. With intrasets you have to throw away good steels. 2) A pocketful of bits is enough for a day's work. You haul an armful of steel with intrasets. 3) You can change bit gauge sizes fast on the same steel. Using intrasets, you have to change the whole steel. 4) You carry only the bit to the shop for resharpening. With intrasets you lug the whole steel. 5) You get longer gauge wear because there are four

carbide cutting edges. Most intrasets have only two.

The new Timken tapered bit's new frontal design features clear chips faster (right). And you get superior wear-resistance with added shock-resistance because of new special-analysis carbide inserts. They can be reconditioned many times.

To get removability *plus* strength, get the new Timken tapered bit. For free brochure, write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".



CHIPS CLEAR FASTER because 1) five front holes shoot water or air directly against the rock face and 2) deeper, wider wing clearance lets chips wash back faster.

TIMKEN

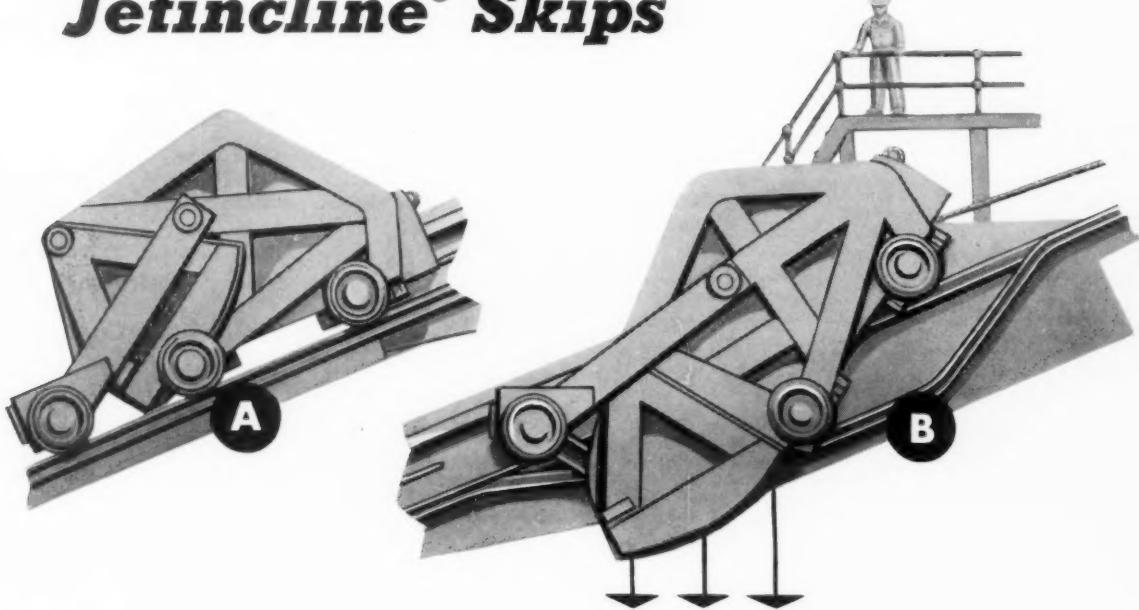
TRADE-MARK REG. U. S. PAT. OFF.

AVAILABLE NOW!

THE AIR-LEG BIT
OF THE FUTURE

For economical open pit haulage . . .

LAKE SHORE ***Jetincline® Skips***



The JETINCLINE Bottom Dump Skip has all the advantages of Lake Shore's famous "Jeto" skip—fast, clean dumping and lasting construction. Capacities are available up to forty-five tons.

Dumps clean every trip. As the skip approaches the dumping station, the narrower rear body rollers follow the lower rails of the scroll and the skip is actuated. As this occurs, the rear door opens and the ore flows out unrestricted. The stubborn, sticky ore in bottom corners is immediately cleaned by the following loose ore.

Dumps fast every trip. Because the skip body rotates a limited amount during dumping, it therefore transfers minimum stresses to the headframe and can be dumped faster and more smoothly than any other type of skip.

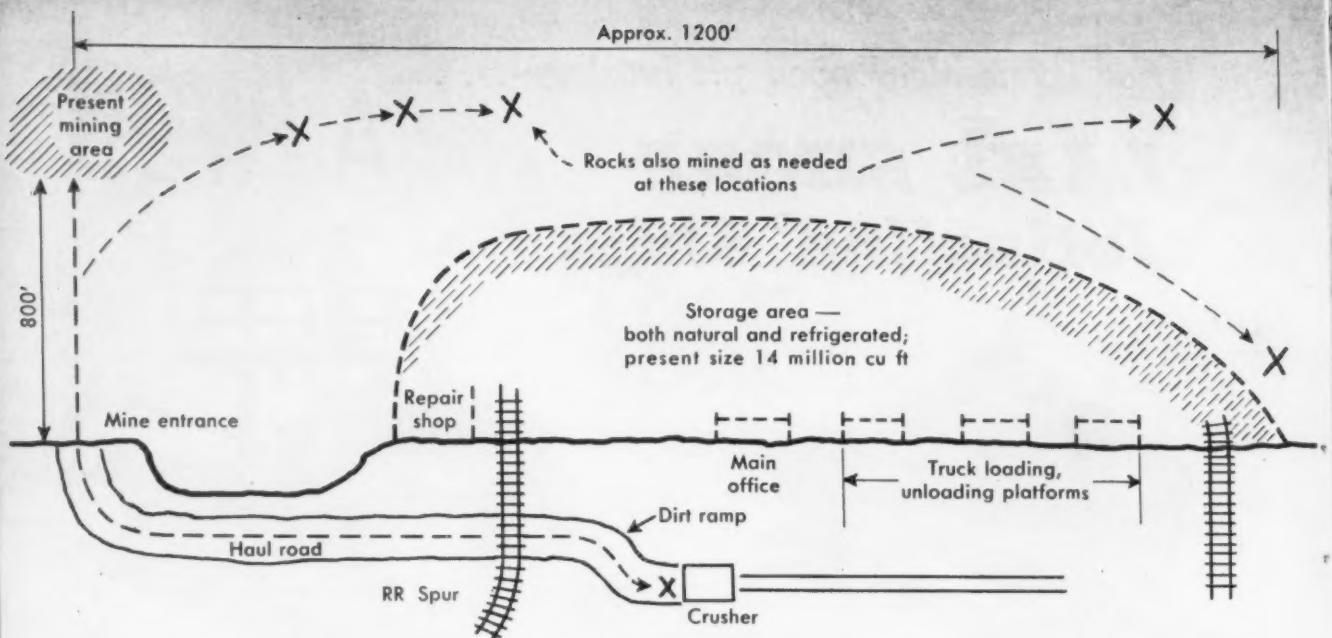
Rugged construction. High manganese wheels of the JETINCLINE skip are equipped with tapered roller bearings and the axles are spring mounted on three point suspension directly to the body of the skip. This arrangement allows the highest concentration of weight and strength to be placed where it is needed most, in the body. In the largest skips the body is reinforced with sections that run to sixteen inches in thickness. In addition, all skips are equipped with heavy cushioned liners inside.

For increased production, many mines have converted to Lake Shore "Jeto" and JETINCLINE bottom dump skips. Their faster dumping and lasting construction are your assurance of more production at lower cost. For full details see your Lake Shore representative or write our Engineering Division, Iron Mountain, Michigan.

LAKE SHORE, Inc.

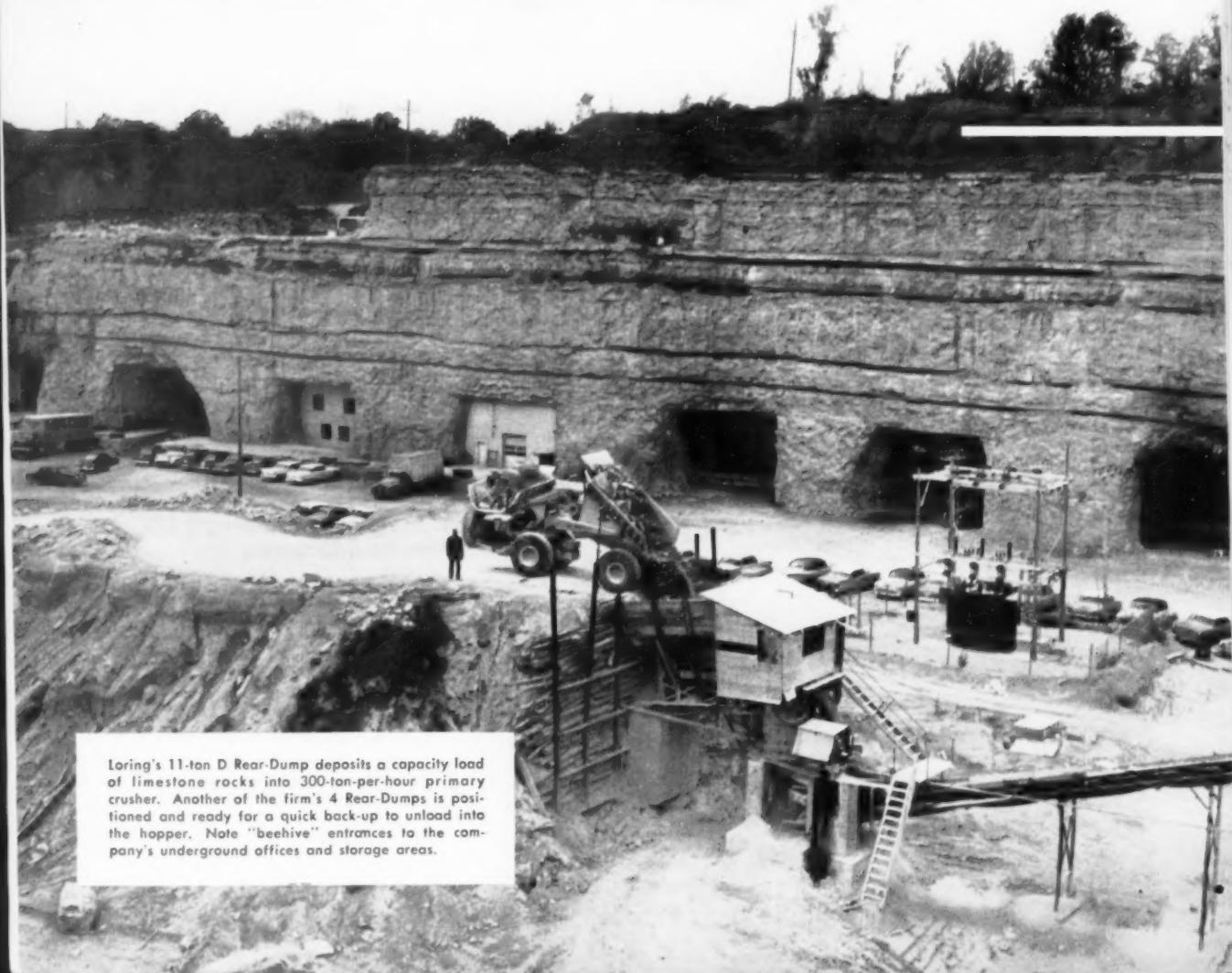
Lake Shore Engineering Division

IRON MOUNTAIN 1, MICHIGAN



Sketch shows present operations of Loring Quarries' mine. Haul distance for Rear-Dumps — from shovel to crusher on top of high dirt ramp — averaged 1320'. Company is currently producing concrete aggregate, bituminous mix, road base, block plant-material, and agriculture limestone. In 1951, the firm began construction of a huge underground cold-storage plant... to make use of excavated space re-

sulting from mining out the rock. Present capacity of the cold-storage plant is 14 million cu ft. It is divided into natural and refrigerated compartments. Spur tracks from the main railroad line enter the storage area for easy removal of cargo. In addition to the storage plant, numerous offices and a large, modern repair shop are also located underground — in the mined out limestone cliffs.



Loring's 11-ton D Rear-Dump deposits a capacity load of limestone rocks into 300-ton-per-hour primary crusher. Another of the firm's 4 Rear-Dumps is positioned and ready for a quick back-up to unload into the hopper. Note "beehive" entrances to the company's underground offices and storage areas.

Two empty Rear-Dumps at the right return to the mine, as a loaded machine at the left starts the haul to the crusher. The short-turning 138-hp units are shovel-loaded with blasted limestone about 800' inside the mine. Says Mine Superintendent Clyde Edmonds, "Rear-Dumps keep us ahead of schedule, because they require less maintenance and repair. These machines do everything asked of them, and they are dependable."



Short-radius turns with electric wagon-type steer proved a major advantage in positioning at the shovel and hopper, and for maneuvering in small areas in the mine. With the body in travel position, D Rear-Dump makes continuous 180° turns in 24'8"; in dump position in only 18'8". Commented Operator Gary Leach, "This hauler is certainly easy to operate and control, less tiring than other equipment. It also has much better maneuverability."

How Underground Quarry solved haul problem with pivot-steer haulers

Finding the right tool for the job, to insure highest production and lowest operating costs, often is a costly, time-consuming task. Read this report on how a large producer of crushed limestone (Loring Quarries, Inc., Bonner Springs, Kansas, U.S.A.) solved a difficult hauling problem with electric-control pivot-steer haulers. Their experience may save you time and money.

Tried two "D's", bought two more

With underground mining operations located beneath limestone cliffs near the Kansas River, Loring Quarries required a hauler that could: (a) work in small areas; (b) carry a good load to the crushing

plant fast, and; (c) be able to reduce hauler maintenance and repair costs. A number of machines were tried, but none could meet all requirements.

The firm then purchased 2 LeTourneau-Westinghouse D Tournapulls with 11-ton Rear-Dumps. Put to work on Loring's difficult haul assignment, the results were outstanding. Highly pleased, the firm added 2 more Tournapull haulers within the next two years.

"Very satisfactory"

Four years after purchase of the 1st unit, Mr. E. P. Conlan, Vice President of Loring Quarries, says, "Our experience with D Rear-Dumps has

been very satisfactory. We like the fact that 'D's' have no frames to twist and break, no dual tires extending into the loading zone that could pick up sharp cutting rocks. And, with the electric-control dump, there are no hydraulic lifts to maintain. Tournapull Rear-Dumps are built simply, and are far easier and less expensive to maintain, both in their mechanical construction and in their single, low-pressure tires.

Write us for more information on rugged LeTourneau-Westinghouse Tournapull Rear-Dumps and how they can help lower your hauling costs. Tournapull Rear-Dumps are available in 3 sizes: 11, 22, and 35-ton capacities.

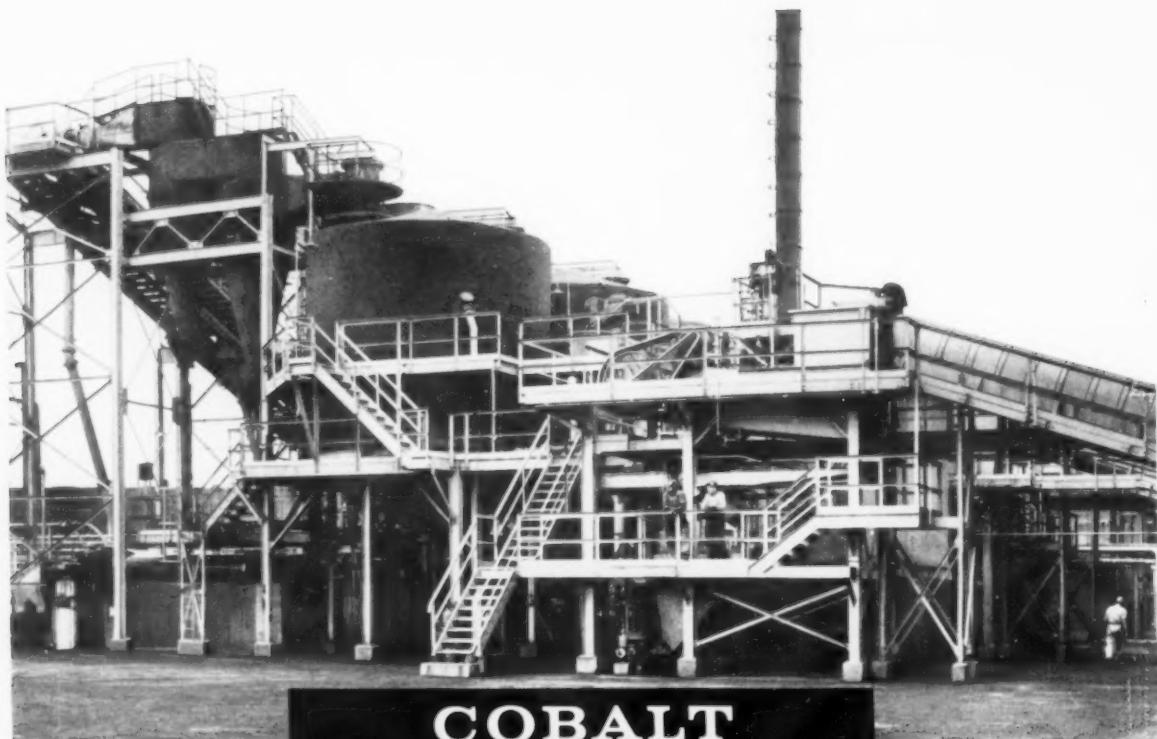
Tournapull—Trademark Reg. U.S. Pat. Off. DR-1821-MQJ-2r



LETOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



COBALT FROM PYRITES

Versatile Dorrco FluoSolids System adds another "plus" at East Coast mill

Installed in 1952 primarily for production of SO_2 gas for acid making and a calcine for iron manufacture, the Dorrco FluoSolids system at a well known East Coast steel mill gives proof of the versatility of the fluidizing technique.

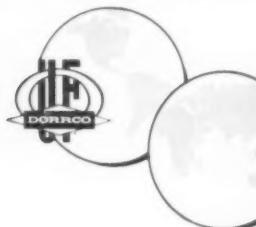
Pyrite received by the mill from one source of supply has a valuable cobalt content. A single roasting operation not only promotes efficient preferential cobalt sulfatization that results in an average 90 percent cobalt extraction at the leaching plant, but also produces SO_2 in sufficient strength for sulfuric acid manufacture as well as calcine for blast furnace charging. The success of this operation, never before attempted in commercial practice, is an outstanding example of the many processing oppor-

tunities offered by the Dorrco FluoSolids system.

The installation at this plant consists of three 18' diam. reactors with pulping and holding tanks, cyclones and other auxiliary equipment. Currently one reactor is used to handle the cobalt-bearing concentrate.

Applications of the Dorrco FluoSolids system in other industries include arsenopyrite gold roasting, zinc concentrate roasting, providing a sulfating roast for copper-zinc concentrates, roasting sulfides for making cooking liquor in sulfite paper mills and limestone calcination.

If you'd like more information on this significant advance in roasting techniques, write to Dorr-Oliver Incorporated, Stamford, Conn.



DORR-OLIVER

INCORPORATED

WORLD - WIDE RESEARCH • ENGINEERING • EQUIPMENT

STAMFORD • CONNECTICUT • U. S. A.

Dorrco and FluoSolids are trademarks of Dorr-Oliver Incorporated. Reg. U. S. Pat. Off.



Nobody Buys a Hole in the Ground

What you pay for is information, and information comes in the form of core—that wonderful petrified record of what the ages have left below the overburden.

And, when it comes to telling the truth, the whole truth and nothing but the truth, few of the world's records are so perfect and so available as core. Anywhere in the world, drive a coring bit into the earth's crust and nature pours forth her secrets, foot after foot, mile after mile, and—fact after fact. Sometimes the facts may be disconcerting to the theorists but, who can argue with facts preserved in rock and presented in a continuous stretch of core?

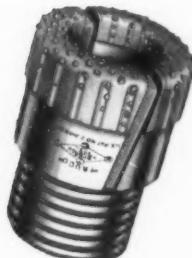
Before the diamond coring bit, geologists would piece together the story from chips flushed out

with the sludge. Often, it was desperately slow and painfully expensive but was the best way available.

Diamond bits changed all that. Diamond bits not only cut down through tough formations with unbelievable speed and determination but, they did something that never had been done before—they delivered complete cores in which geologists could read the story for thousands of feet without the risk of missing some crucial section which might hold the secret that everybody was looking for.

Nowadays, most drillers know that for fast penetration, longer footage and 100% core recovery, you just can't beat Truco bits.

And Truco bits keep on proving it every day.

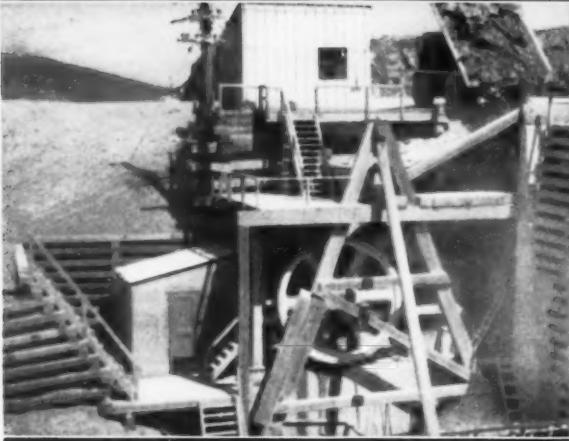


TRUCO DIAMOND BITS by
WHEEL TRUEING TOOL COMPANY
3200 W. Davison Avenue, Detroit 38, Michigan

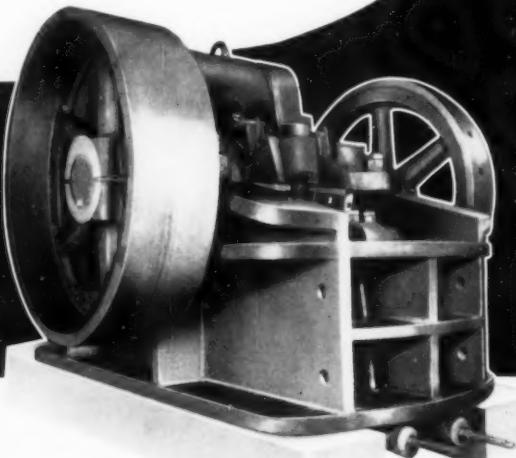
WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada
MEMBER Diamond Core Drill Manufacturers Association



Traylor -MADE
HB JAW CRUSHER



56" x 72" Type HB Jaw Crusher installed in quarry of a steel mill.



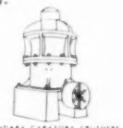
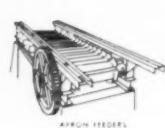
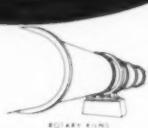
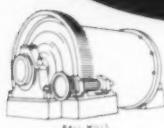
Over half a century of experience results in many advantages for the user of Traylor HB Jaw Crushers. Jaw plates are the famous curved type—the pitman shaft is made of annealed open hearth forged steel—the pitman is light but of great strength—the swing jaw is made of cast steel of extra-heavy box section design to secure maximum strength. These are a few of the features of the Traylor HB Jaw Crusher. For additional information, write for bulletin No. 5105 today!

Traylor

TRAYLOR ENGINEERING & MFG. CO. 1052 MILL ST., ALLENTOWN, PA.

Sales Offices: New York — Chicago — San Francisco

Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.



"BIGGEST" OPEN PIT OPERATION IS HANDLED BY CAT MACHINES

Cat DW21 (Series C) Tractor with Athey PR21 Wagon removing overburden in an open pit copper mine in Northern Rhodesia. Their speed and power make them fast, dependable producers.



With a spread that includes 26 of all types of Cat machines—working the largest open pit copper mining operation in Africa—a mining company in Northern Rhodesia is excavating 600,000 tons of earth and ore per month.

This owner has purchased Caterpillar machines because of their ability to keep going 23 hours a day (one hour required for servicing)—with a minimum of down time. A matched fleet of Cat DW20 (Series E) and DW21 (Series C) Tractors with Athey Trailers spearheads the job, and has the speed, guts and capacity that add up to a low cost-per-cu.-yd. figure.

Cat wheel-type Tractors have always had the rim-pulls and fast-cycle potential to enable owners anywhere to meet production dates at an operating profit. Now new DW21 (Series D) and DW20 (Series F) Tractors are available. They feature the new Cat Super-Turbo Engine—that produces 320 HP (maximum output) and 28% torque rise!

Athey Trailers feature low center of gravity and plenty of ground clearance for excellent roadability. And both the Caterpillar and Athey units have the built-in dependability to get the job done without costly lay-ups for major overhaul.

Remember, your operators and mechanics prefer Cat machines. End result is: greater efficiency—high production from your crews.

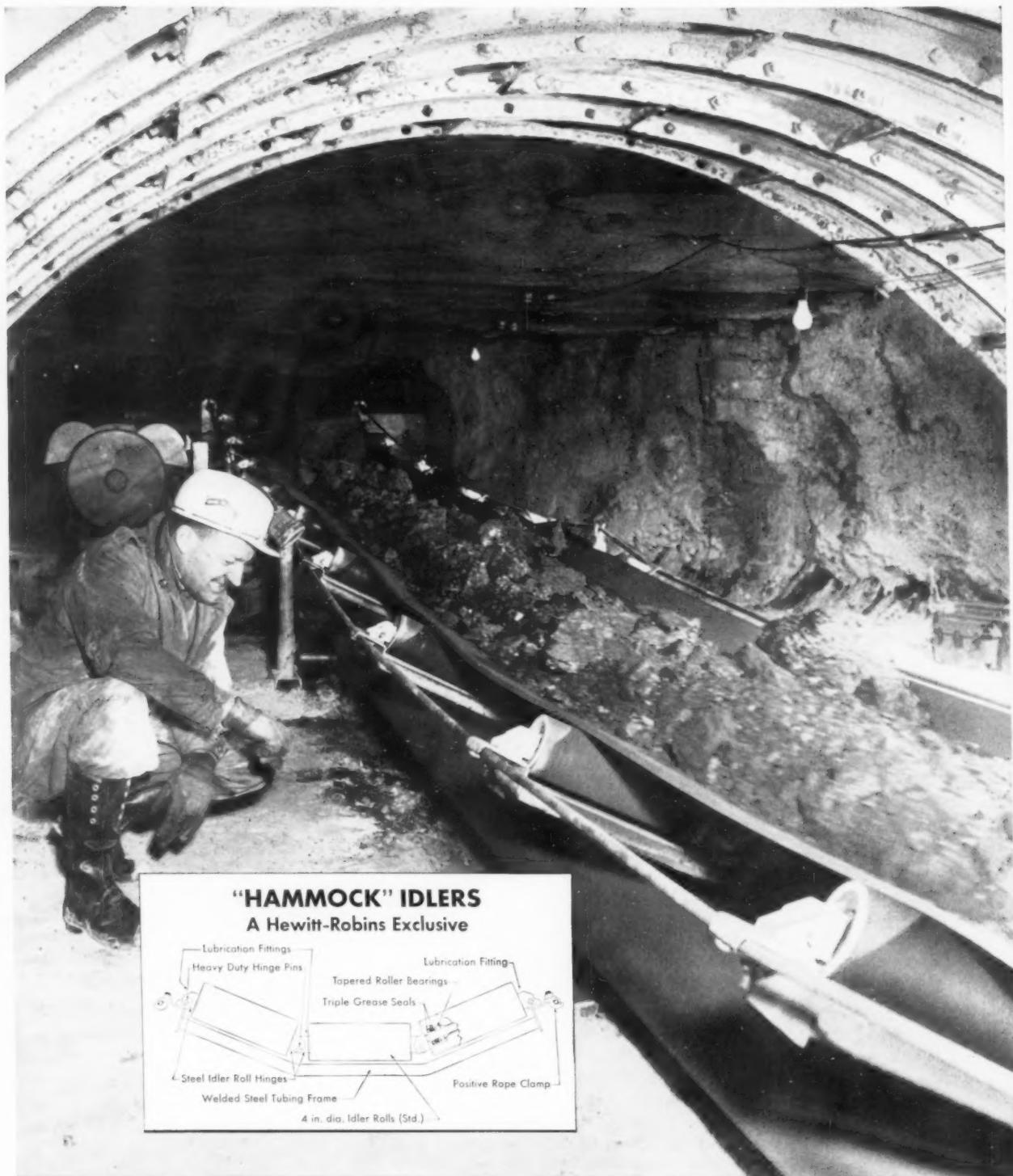
Get in touch with your Caterpillar Dealer TODAY for a demonstration. He will explain why resale and trade-in values stay high. Standardize with Cat machines; stand to make more profit on the job.

Caterpillar Tractor Co., San Francisco, Cal.; Peoria, Ill., U.S.A.

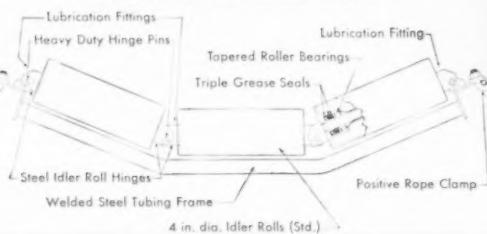
CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

THE ONLY COMPLETE
TRACTOR-TRAILER LINE...
BY THE LEADERS



"HAMMOCK" IDLERS
A Hewitt-Robins Exclusive



Self-contained, with its own anchor stands, the "Rope Stringer" conveyor can be used with any head or tail equipment.



"ROPE STRINGER"

The last word in low-cost, high-capacity, easy-to-handle conveyors

See how Hewitt-Robins has made the "Rope Stringer" conveyor easy to handle, economical to buy, simple to install and operate!

The "Rope Stringer" conveyor consists of simple support and anchor stands, the supporting wire ropes, Hewitt-Robins exclusive "Hammock" idlers, and Hewitt-Robins conveyor belt. The conveyor can be extended by a small crew and can be dismantled and set up in a new location in a fraction of the time required by rigid conveyors!

With this "Rope Stringer" conveyor, spillage is greatly reduced. Thanks to the catenary action of the "Hammock" idlers, spillage is less than one third that of a rigid deck conveyor. And safety is increased, too—the "Hammock" idler and frame assembly can be quickly removed or replaced as a unit, with the belt in place!

"Rope Stringer" Conveyor Advantages

Valuable features incorporated into this new Hewitt-Robins rope conveyor are made possible by the use of flexible supports and a unique "Hammock" idler arrangement. These give several major advantages:

Easy Installation

- Idlers are quickly skidded into position between belt strands.
- Trougner spacing is readily varied to suit conditions.
- Anchor stand assemblies can be bottom or roof mounted.

Better Operation

- Minimum spillage—load and belt are continuously centered by catenary action of hinged "Hammock" idlers.
- Longer belt life through cushioning action of "Hammock" idlers.
- Rounded idler frame protects return belt at points of severe dip.
- No training idlers required.
- Level travel assured because either leg of stand can be adjusted for height.

Provision for Relubrication

- Triple-sealed bearings can be easily relubricated.

Simple, Sturdy Construction

- Strong, welded tube spreader frame.
- Substantial, long-life link and hinge design idler rolls.
- 4, 5, or 6 in. idler rolls available.
- Removable link pin for idler roll replacement.

Maximum Safety

- Idler rolls and frame positioned as a unit.
- Double spreader prevents idler rolls from dropping onto return belt.

See for yourself how this new "Rope Stringer" conveyor can pay for itself promptly in *your* operations! Only Hewitt-Robins provides all the advantages of the "Rope Stringer" conveyor—*complete* with the H-R belt of your choice! For further details, consult your Hewitt-Robins representative.



HEWITT-ROBINS

THE NAME THAT MEANS EVERYTHING IN BULK MATERIALS HANDLING SYSTEMS...
CONVEYOR BELTING AND IDLERS • POWER TRANSMISSION DRIVES • INDUSTRIAL HOSE • VIBRATING CONVEYORS, SCREENS & SHAKEOUTS



3 reasons why you should specify NORDBERG GRINDING MILLS

1. Advanced Engineering

Nordberg mill design reflects significant technological improvements that may measurably affect your installation and operating costs. Sealed trunnion bearings; positive bearing lubrication; optimum life of wearing parts are among the features that will benefit you.

2. Quality Manufacture

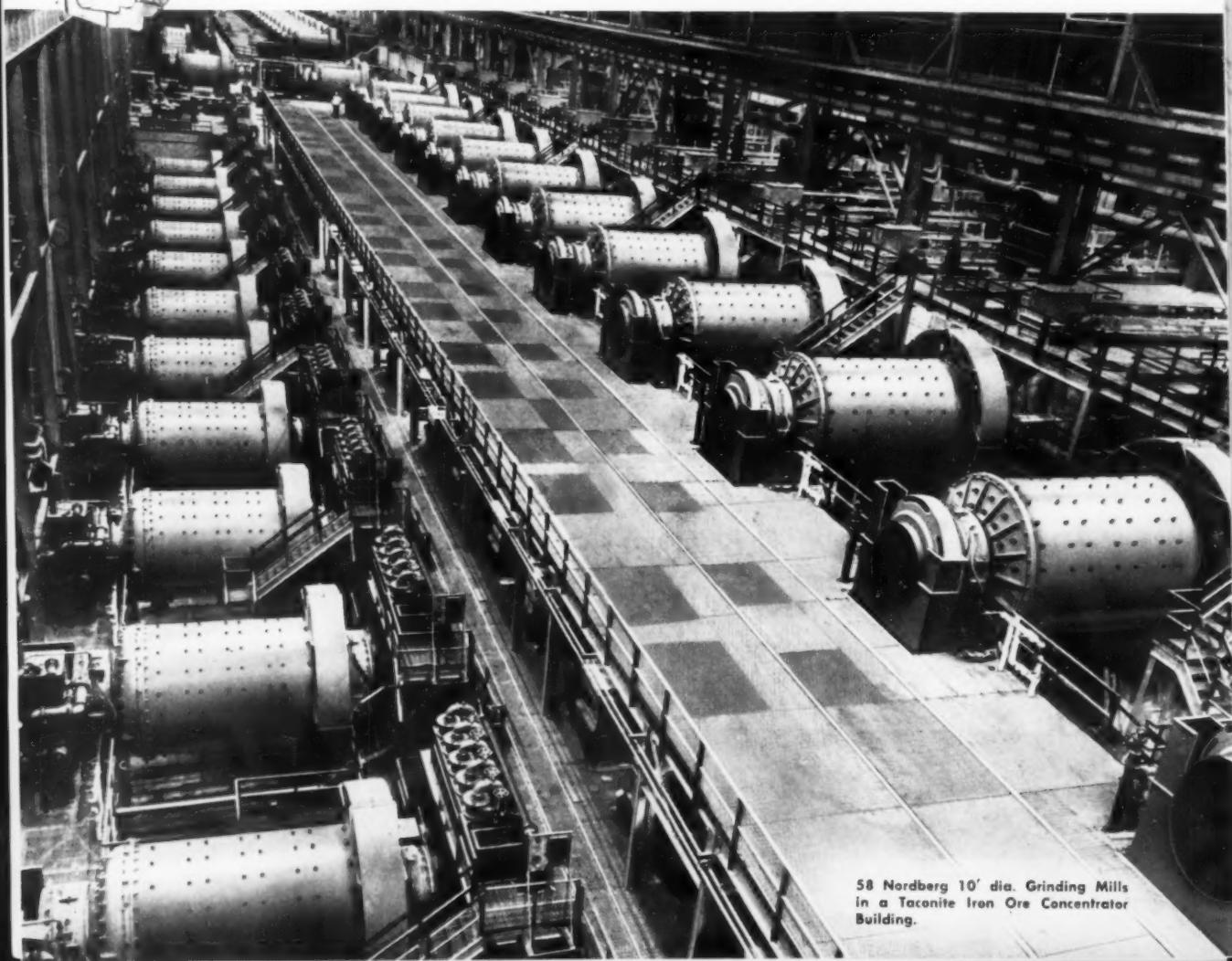
Nordberg Mills are (1) precision built to rigid specifications in shops renowned for (2) skilled manufacturing personnel, and (3)

modern machine tools and equipment to assure quality workmanship. Good reason why the name *NORDBERG* has always signified the *ultimate* in mining, quarrying and process machinery.

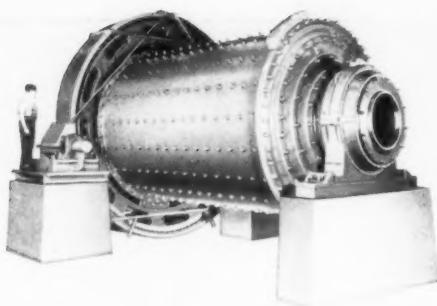
3. Dependable Operation

A team of experienced application engineers with a sound understanding of your milling operations qualifies Nordberg to serve you. More important, it assures you of the right machinery for the job . . . machinery that must be dependable and will continually produce to your specifications.

Nordberg Grinding Mills are built to meet specified conditions for wet or dry grinding—in the manufacture of cement; the fine reduction of metallic and non-metallic minerals; and in numerous other processes where friable material must be comminuted to fine sizes at low cost per ton. They are available with grate, overflow or peripheral discharge . . . and are built in sizes from 6 feet to 13 feet in diameter and up to 50 feet in length.

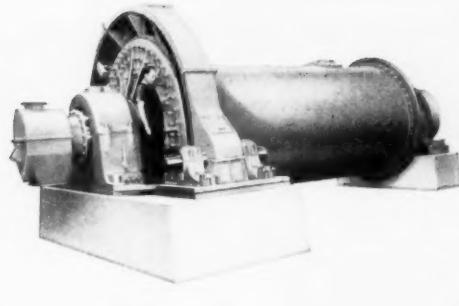


58 Nordberg 10' dia. Grinding Mills
in a Taconite Iron Ore Concentrator
Building.



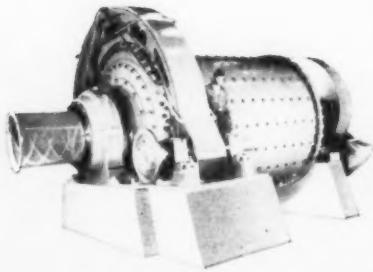
ROD MILLS

For the coarser or primary grinding stages of milling plants.



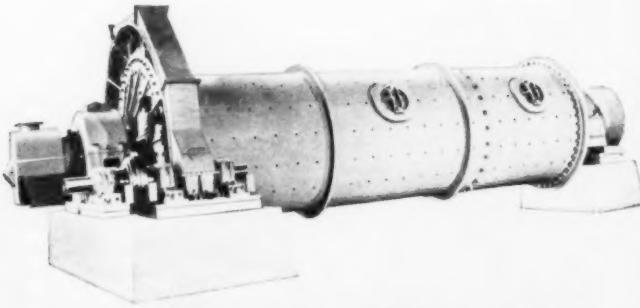
TUBE MILLS

These Nordberg units are used primarily where extremely fine grinding is required.



BALL MILLS

Having principal application in the fine grinding of ores, and minerals, and as preliminary mills operating in tandem or series with tube or compartment mills.



COMPARTMENT MILLS

For multi-stage grinding to ultra-fine specifications, these Nordberg Mills are built in lengths to 50 ft., with two, three, or more compartments.



BULLETIN 232 covers the complete line of Nordberg Grinding Mills for efficient, low cost processing of ores and industrial minerals. Write for a copy today.



BULLETIN 263 describes the advantages of using Nordberg "HI-HARD" for mill liners and other machinery components subject to rapid abrasive wear. Copy on request.



SYMONS®
GYRATORY CRUSHERS



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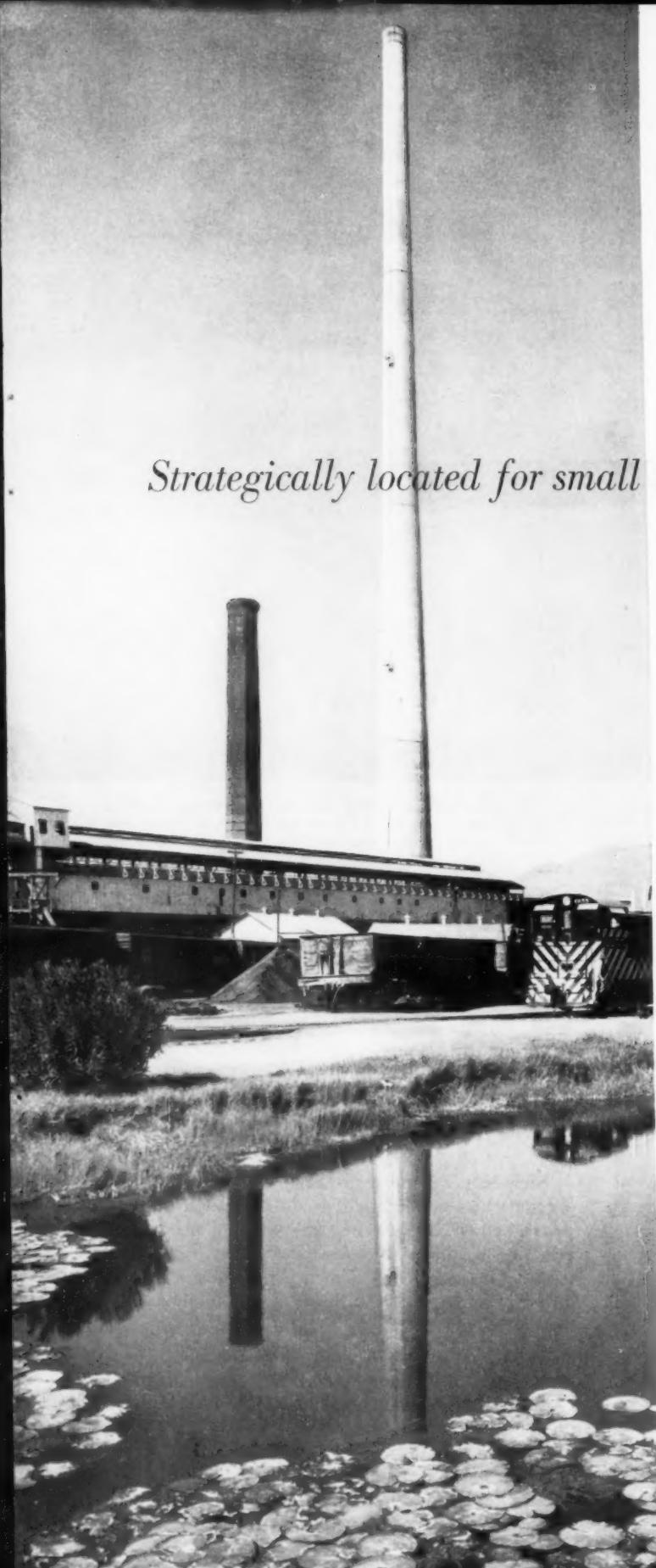
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58-54

ASARCO



Stripping overburden at iron ore mining operation near Greenville, Ala., this Caterpillar D9 Tractor with No. 9S Bulldozer "pushes more dirt than any other piece of equipment I have ever seen," says Owner J. Bryce Smith.

Caterpillar-built "track team" produce 100 carloads a week

J. Bryce Smith, owner of the Smith Mining Co. of Luverne, Ala., will tell you he has a winning Cat-built "track team" at work on his iron ore strip mining operation near Greenville, Ala. Here's what he says:

Cat D9 Tractor with No. 9S Bulldozer—"With the 'dozer it will push more dirt than any piece of equipment I have ever seen."

Cat D6 Tractor with No. 6A Bulldozer—"Although we've put more than 5,400 hours on it, the head and pan have never been removed. It has just as much power as when it was a month old. This machine has long since paid for itself."

Cat No. 977 Traxcavator—"We use it for a variety of jobs, and it does all types of work well."

Completing the team are a powerful Caterpillar D8 Tractor with No. 8S Bulldozer and several Cat Engines driving pumps for the iron ore washing plants and powering a shovel. Average overburden is eight to ten feet, and as deep as 25 feet. The company is shipping an average of 100 carloads of iron ore per week from Greenville.

High production like this—with minimum operating expense—is what mine owners everywhere get from modern Caterpillar-built equipment. The 320 HP (flywheel) D9, for example, handles about 12 cu. yd. on every pass with the No. 9S Bulldozer. Despite its massive size, it is one of the easiest of all tractors to operate because of power-boosted controls and excellent visibility. It's available with either torque



Operated for 5,400 hours, this Cat D6 Tractor with No. 6A Bulldozer has the same power it had when it was a month old, according to Mr. Smith. "It has long since paid for itself," he says.



This Caterpillar No. 977 Traxcavator, here seen loading out overburden, is used for many different jobs on the Smith Mining Co. operation. "It does all types of work well," Mr. Smith reports.

helps Smith Mining Co. at iron ore strip mine

converter or direct drive with the exclusive Caterpillar oil clutch.

The versatile No. 977 is typical of the Traxcavator line. It's built from the ground up as an excavator-loader. About 26 sq. ft. of ground-gripping track provide tremendous traction to crowd the 2 1/4-yd. bucket full every time. Controls are easily reached from the operator's comfortable seat.

These are just a few of the star performers on the Cat-built "track team." Get the full story on them from your Caterpillar Dealer. He'll prove the dollars-and-cents value of his track-type equipment in mining operations, demonstrate on your job. And he stands ready with *dependable* parts and service.

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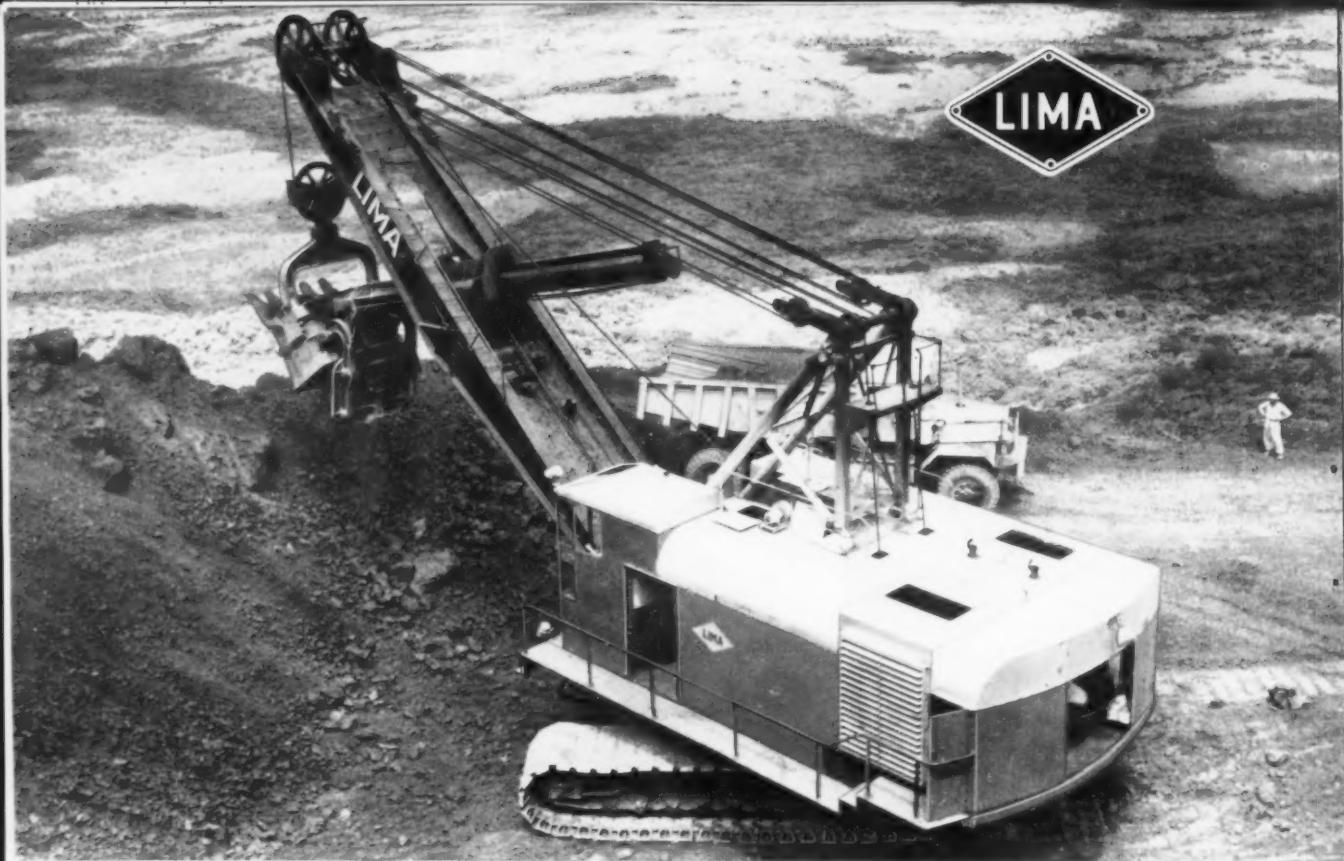
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Lima Type 2400 6-cu. yd. shovel at work loading ore in Venezuela iron mine.

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Lima Type 604 1 1/2-cu. yd. shovel and Lima Type 1201 3-cu. yd. shovel loading iron ore on Mesabi Iron Range.

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In this open-circuit operation an inorganic chemical is precipitated as 0.5 to 1.0 micron particles from an aqueous medium in a hydroseparator reactor. Precipitates are subsequently settled in a 325' diameter thickener. Underflow is subject to further processing, overflow goes to waste.

Loss of values to the overflow—particularly evident on cold and windy days—cut production seriously. Addition of 2 lb. per hour of AEROFLOC 550 Reagent to the reactor feed (0.03 lb. AEROFLOC 550 per ton of dry solids in the circuit) now effectively flocculates and settles the precipitate.

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In this closed-circuit coal preparation plant all wash water from jigs and flotation is deslimed, clarified and reused. Coarse waste is dewatered on screens, slimes are removed in filter presses. Build-up of slimes in the circulating waste water caused premature filter blinding and excessive down-time. Despite the addition of a starch-base flocculant in quantities up to 12 lb./ton of slimes, it was almost im-

possible to keep the plant operating smoothly at its rated capacity.

Addition of only 0.4 lb. of AEROFLOC 550 per ton of slimes now gives perfect control with greatly increased filtration rates on both flotation concentrates and waste slimes. Additional savings accrue through the handling of a much smaller quantity of flocculant.

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At this mill a non-metallic mineral concentrate is processed further. Important prior step is concentrate filtration to produce a constant-moisture content, easy-to-handle filter cake for subsequent processing. Lack of adequate surge capacity between filters and subsequent processing equipment imposed a constant and excessive load on the filters with consequent unavoidable variations in quality and quantity of filter cake.

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AEROFLOC 550 Reagent is serving many mills in many ways to solve settling and filtration problems. Perhaps it can help you improve solid-liquid separation operations. Samples for test, and comprehensive technical data are available. Cyanamid Field Engineers will be glad to advise on its most effective use.

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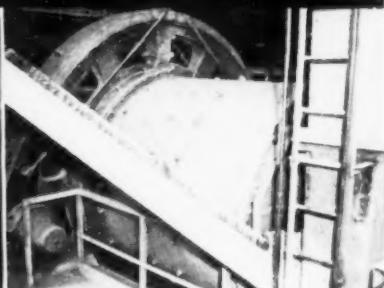
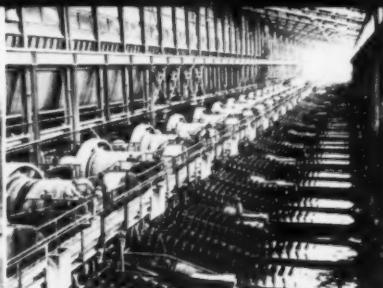
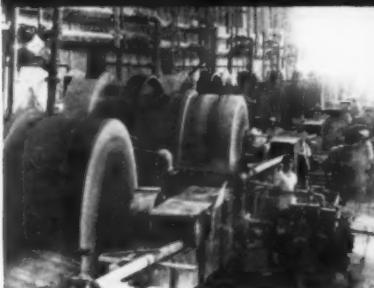
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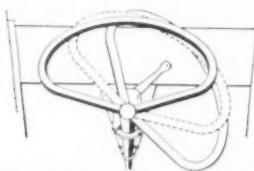
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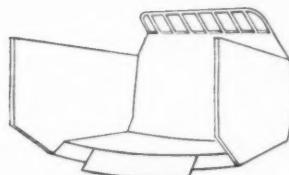
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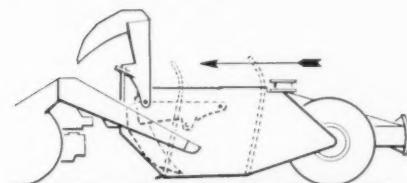
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Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

June 1958

INTERNATIONAL PANORAMA

Steel Industry Plans Larger Research Programs

The need for new products, new processes, and improvements in old products and processes in the steel industry has resulted in greatly increased scientific research programs by many major steel companies. Although expansion of plant facilities is expected to decrease in the next year or two, expenditures for research staffs and facilities will continue to grow.

U. S. Steel Corporation's research center at Monroeville, Pennsylvania now employs a staff of 900 persons. Activities cover the full range of steel industry problems, from raw materials to finished product. In the field of iron ore, pilot plant investigations have provided data for the design of a commercial-size plant for the concentration of specular hematite-quartz ores, which may become an important future source of iron. Other projects currently underway include fundamental studies of boron steels, studies of sintering practices, and experimental rolling of stainless and alloy steels by the "sandwich" rolling process.

One of the most important projects undertaken as a joint venture of Republic Steel Corporation and National Lead Company is development of the R-N process. This project involves direct reduction of iron ore and shows promise of being the first economically successful direct reduction method in the United States.

Pilot plant and process studies of the Jones & Laughlin Steel Corporation resulted in the installation of a new benzene purification plant. Digital computers are used to apply operations analyses to problems such as ore prospecting, blast furnace operations, and scrap allocation.

Extensive experiments in the direct reduction of ore in electric arc furnaces have been carried on by the research department of Sharon Steel Corporation. Copperweld Steel Company is also working on the possibility of using direct-reduced iron ore in the metallic charge for an electric melting furnace.

Methods of improving ore burdens for the blast furnace to obtain increased tonnage with existing equipment are currently being studied at research laboratories of Wheeling Steel Corporation. Other activities are aimed at improving quality and creating new products.

Armco Steel Corporation is making progress in efforts to develop a method of utilizing powered liquid or gaseous fuels for the reduction of high-grade iron ores to produce a sponge iron product that is suitable for steel manufacture in open hearths and electric furnaces, with decreased costs and less capital investment. During 1957, the company developed a new precipitation hardening stainless steel, PH 15-7 Mo, to be used in aircraft and missiles.

GREENFIELD, MAINE—A large deposit of iron-manganese has been discovered by a geological and aeromagnetic reconnaissance survey made by the Geological Survey of the Maine Department of Economic Development. The mineralized formation has been traced over a width of one quarter mile and a length of eight miles.

SANTIAGO, CHILE—Empresa Nacional De Fundiciones has awarded the contract to build a 30,000-annual-ton blister copper smelter to the West German combine—Kloeckner Industrieanlagen.

PORT HOPE, ONTARIO—Canada is now self-sufficient in atomic energy with the production of the first uranium metal by a new process using magnesium for reduction.

TUCSON, ARIZONA—American Smelting and Refining Company has announced that its East Pima ore body will definitely make a good mine. No date has been set to bring it into production.

BUTTE, MONTANA—The Anaconda Company has not materially reduced expenditures for exploration and does not plan to do so at this time.

SALT POND, GHANA—The Ghana government will hire an independent mining expert to formulate a long range plan to be presented to the legislature for Cost Aid to gold mines.

MOUNT ISA, AUSTRALIA—Production of copper, lead, and zinc has been increased by Mount Isa Mines Ltd. as the first stage of expansion has been completed. Daily ore output was up in March to 5,300 tons per day from 4,000.

KUCHING, SARAWAK—Semantan Bauxite Limited has made the first shipment of bauxite from this country. Shipment was made to Formosa which with Japan is scheduled to receive 33,000 tons per month.

LAKEVIEW, IDAHO—Federal Uranium Corporation and Conjecture Mines, Inc. have completed an exploration program at the Conjecture silver-lead mine and are making plans for production and milling. A 1,000-foot-deep production shaft will be sunk.

SEATTLE, WASHINGTON—New York-Alaska Gold Dredging Corporation, large Alaskan gold dredge operator, has assumed operating control of Beauce Placer Mining Company and plans to have a connected bucket line gold dredge operating in the Chaudiere River Valley in southern Quebec next year.

MOAB, UTAH—The highest grade truck load of uranium ore ever shipped to the Atomic Energy Commission assayed 22.92 percent U.O.₂ and weighed 22.25 tons. It was shipped by Lisbon Uranium Company from the Ike-Nixon mines. The shipment was only one to qualify for AEC's \$10,000 bonus. Value of ore plus bonus was \$61,016.72.

VIRGINIA, ORANGE FREE STATE—The Virginia Orange Free State Gold Mining Company Limited in which Kennecott Copper Corporation has a substantial interest is replacing its 190-foot-high steel headframe with a reinforced concrete headframe. Cost about \$750,000.

CLEVELAND, OHIO—Brush Beryllium Company has been awarded the world's largest commercial contract for fabricated beryllium metal by Centre d'Etude de l'Energie Nucleaire of Belgium. The beryllium metal will be used for two uranium core matrices for Belgian Atomic Reactor-2.

GARFIELD, UTAH—Kennebott Copper Corporation is paying American Smelting and Refining Company \$20,000,000 for the world's largest copper smelter here. The smelter will continue to treat Utah Copper Division flotation concentrates for corporation account rather than on a toll basis.

In July—Geochemical Prospecting Leads to Craigmont Ore

Duties on Unmanufactured Lead and Zinc Win Tariff Commission Support

The United States Tariff Commission, on April 24, submitted to the President its report on the "escape-clause" investigation regarding lead and zinc.

The commission unanimously found that unmanufactured lead and zinc are being imported into the United States in such increased quantities as to cause serious injury to the domestic industries producing like or directly competitive products. The six members of the commission divided evenly on the remedy that is necessary, and each group of three issued a separate statement in support of its findings and its recommendations for remedying the injury.

One group recommended the application of the maximum permissible rates of duty, as well as quantitative restrictions, on imports of unmanufactured lead and zinc of 221,700 short tons of lead, and 325,600 short tons zinc per year.

The other group recommended the reimposition of the rates of duty originally imposed by the Tariff Act of 1930, and opposed quota limitations of any kind. Existing and recommended rates are shown in the table.

The President has 60 days in which to act on the recommendations. Washington sources indicate that the Administration's stabilization program is the answer to the Tariff

Commission's findings and that the stabilization program is designed to please domestic miners so that the President will take no action on the Tariff which then will please the foreign miners.

Unmanufactured Lead and Zinc Rates of Duty in Tariff Act of 1930, Existing on January 1, 1945, and Maximum Rates Permissible Through Escape Clause

Article	Originally Enacted in Tariff Act of 1930 ¹	Existing on January 1, 1945	Currently In Effect	Maximum Possible ²
<i>Unmanufactured Lead:</i>				
Ores, Flue dust, Mattes	1.5¢	1.2¢	0.75¢	1.80¢
Lead bullion				
Pigs, bars, dross, scrap, etc.	2.25¢	1.7¢	1.065¢	2.55¢
<i>Unmanufactured Zinc:</i>				
Ores, excepting pyrite containing not more than 3 percent zinc.	1.5¢	1.2¢	0.80¢	1.8¢
Zinc in blocks, pigs, slabs	1.75¢	1.4¢	0.70¢	2.1¢
Old and worn out zinc	1.5¢	1.5¢	0.75¢	2.25¢

1. Commissioners Sutton, Jones, and Dowling (Democrats) find that for an indefinite period these rates should apply.

2. Commissioners Brossard, Talbot, and Schreiber (Republicans) find that for an indefinite period these maximum rates should apply.

Administration Proposes Subsidies For Pb, Zn, Cu, W and CaF₂ Output

In a surprise move, the Administration, through Secretary of the Interior Seaton, proposed on April 28th a program to stabilize the domestic mining industry with stabilization payments on lead, zinc, copper, tungsten, and acid-grade fluorspar production.

Secretary Seaton, with the approval of the President, recommended the five-year program to the Senate Minerals Subcommittee of the Interior and Insular Affairs Committee. He estimated the cost of the program in the first year as \$161,090,000 and that annual costs would diminish in subsequent years with increased demands in a vigorous economy.

Stabilization payments would be made on following basis:

Commodity	Stabilization Price	Annual Limitation Tons
Copper	27.50¢ per pound	1,000,000
Lead	14.75¢ per pound	350,000
Zinc	12.75¢ per pound	550,000
Fluorspar	\$48.00 per short ton	180,000
Tungsten	\$36.00 per short ton unit	375,000 units

Secretary Seaton also recommended that necessary legislative steps be taken to extend and support the domestic exploration program (DMEA) to assure future mineral availability.

The sum of \$2,500,000 for specialized research was recommended as follows: Development of refractories to contain fission and fusion reactions and to withstand exceptionally high operating temperatures of the new fuels. Research on high temperature metals and alloys needed in high altitude jet engines and rockets. Development of special structural metals for nuclear reactor systems. Development of new uses of materials with unusual properties, such as the rare earths.

While Secretary Seaton said that his program has the support of the Interior, Commerce, Treasury, and State Departments, the Office of Defense Mobilization, and other high officials, the initial reaction by key Senators was not favorable. Western Senators especially supported a tariff and/or quota system.

Mining spokesmen also favored the tariff and felt that the stabilization prices were too low at today's costs. The lead-zinc industry was particularly critical of the stabilization and pointed out that the Administration (Secretary Seaton) only last June proposed to Congress that per-unit prices for lead be 17 cents and 14.5 for zinc. How the new figures of 14.75 cents for lead and 12.75 cents for zinc were arrived at is unknown.

Another unknown factor is will Congress appropriate funds for the program? And will it continue to do it each year for the next five years?



DEEP ROAD CUT is required for entry to Mountain Copper's open pit to keep lower levels drained. Occurrence of torrential rains dictated this precaution.



DIESEL SHOVEL, made by Bucyrus Erie and equipped with a $1\frac{1}{2}$ -yard bucket, is used for loading ore and for tight stripping adjacent to hanging wall of pyrite ore body.

Open Pit Replaces Underground Mine At Mountain Copper Pyrite Operation

By STANLEY H. DAYTON
Associate Editor

Mountain Copper Company of California has replaced underground pyrite mining activities with a newly developed open pit at its Iron Mountain property, nine miles northwest of Redding, California.

The project required the stripping of 2,500,000 tons of overburden to place the open pit in production. But the most newsworthy feature of the development is the unusually high stripping ratio. The open pit is centered on the recently discovered Brick Flat ore body, and eight tons of waste will be moved to mine one ton of pyrite ore.

Many factors figured in the decision to open pit the Brick Flat. Perhaps most important was the fact that the open pit offered the dual opportunity to extend ore reserves and to recover all the ore. Through a geological peculiarity, the Brick Flat open pit can be carried down to yield favorable stripping ratios for other massive pyrite bodies to the northeast. Many of these deposits have been mined by under-

ground induced caving methods; but pillars of ore remain between caved stopes. It has been conservatively estimated that the open pit will double the life of the Iron Mountain property. All this could be accomplished for the same cost of producing high-grade ore by caving.

Green Crew Undertake Job

A really remarkable feature of the conversion, however, almost escapes notice. Planning, stripping, and open pit mining were carried out by existing personnel on the company payroll, few of whom had ever had any open-pit experience. This included both labor and some members of the operating staff. Yet the changeover was carried out smoothly. When the proposed project was approved, the crew of underground miners stepped right into a tight stripping schedule.

A road from the crushing site to the mine site was cut in the first half of 1955. The rear-dump trucks for the pit weren't delivered until mid-June of 1955. Shortly thereafter stripping reached peak performance of 500,000 tons per month. The first open pit ore

was produced in January 1956 when 2,500,000 tons of cover had been moved. By mid-1956 the open pit was yielding the entire daily output of ore and the underground mine was ready for salvage.

During the initial stripping phase, an average of 5,000 tons of overburden was removed each shift, using a $4\frac{1}{2}$ -yard Bucyrus Erie electric shovel and four Euclid 22-ton capacity trucks.

This record manifests careful planning and coordination of the entire venture. Few firms lacking experienced open pit personnel would tackle such a project without at least contracting the stripping to determine feasibility of the operation.

Today, Mountain Copper is turning out 400 tons of pyrite ore, with a sulfur content of 48 to 50 percent, per one-shift-day. Stripping of waste is still progressing, and the crew averages $2\frac{1}{3}$ of a shift on waste and $1\frac{1}{3}$ shift on ore production each day. In the first 10 months of 1957, 631,500 tons of waste were removed in addition to ore production. This waste was moved on a $\frac{2}{3}$ -shift-day, five days a week. The entire output is shipped to



JOY HEAVYWEIGHT CHAMPION puts down 7 $\frac{1}{2}$ -inch holes in 40-foot waste benches. Challenger drills ore.



ELECTRIC SHOVEL is used for stripping on waste benches only. Shovel is a Bucyrus-Erie 110-B rated at 4½ yard capacity. A 1½-yard Bucyrus Erie Diesel shovel loads out ore and strips tight places along hanging wall.

Stauffer Chemical Company and General Chemical Company in the San Francisco Bay Area where it is used to make sulphuric acid.

Other Unusual Features

The mine was equipped for conventional shovel loading and truck haulage. From an operational standpoint, an outstanding characteristic is the extremely hard and dense nature of the ore. Another factor complicates mining—the area is subject to torrential rainfalls.

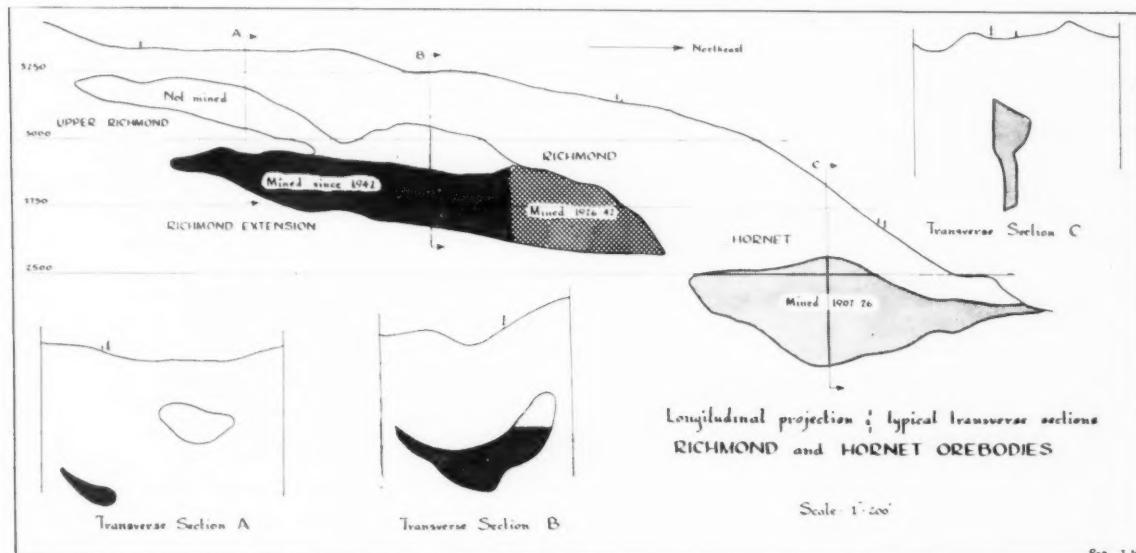
It isn't unusual to experience 6 inches of rain in 24 hours during the rainy season. In a matter of hours a tiny brook can be transformed into a raging river. The open pit was developed at the confluence of three major faults and valleys. For this reason an open end had to be designed into the pit for drainage.

Another dominant feature is the great relief of the region. This provides ample space for dumping waste, but it hampers transportation. The ore

is trucked 8,500 to 10,000 feet from the mine to the crushing plant. From the crushing plant, a Riblet aerial tramway delivers the ore nearly four miles to a railroad siding near the Sacramento River. The tramway features completely automatic loading and discharge terminals.

Once A Big Cu Producer

To fully grasp what has been done and what will be done at the Iron Mountain property it is necessary to



OPEN PIT is centered over the Upper Richmond (Brick Flat) orebody. It will be carried down to recover pillars left in

Courtesy California Division of Mines
Richmond Extension and Richmond. Both the latter were mined by underground induced caving methods.



WATERPROOF CARTRIDGES must be used for blasting purposes due to wet nature of ground. This hole is in ore and is being loaded with 3-by 16-inch ammonia dynamite.

take a look at the geology and past production in the district.

The property can lay claim to being one of the oldest active producers in the state of California. Few people probably realize that Mountain Copper was once the tenth largest copper producer in the world. The West Shasta district in which the mine is located once boasted five copper smelters. One of the first McDougal roasters ever installed was introduced to the West Shasta smelting industry about the turn of the century. All of this is past history now. Many of the known economic and mineable copper-zinc deposits have long since been depleted. All of the mines, with the exception of Mountain Copper, are idle now. If it hadn't been for the occurrence of large bodies of massive pyrite, the Iron Mountain property wouldn't be in production today.

The Iron Mountain property lies at the southern tip of the West Shasta copper-zinc district, a mineralized belt some eight miles long in a northeast direction, the belt is two miles wide. At least nine producing mines and many prospects have been worked in the past within this belt.

All of the known sulphide mineral deposits of the West Shasta district occur in the so-called Balaklala rhyolite. There is a great deal of debate regarding the origin of this host rock. Some geologists recognize both intrusive and sedimentary features within the formation, while others maintain that it is extrusive. The latter group holds that the Balaklala rhyo-

lite consists of flows with interbedded layers of volcanic fragments and tuffaceous material. Both groups recognize three members in the Balaklala formation. Both groups agree that the ore deposits were localized in the upper middle member of the formation.

The Balaklala formation is underlain by rock described as consisting of andesitic flows by one group of writers; while another group says that the Balaklala is underlain by alaskite intrusions. The Balaklala is overlain by sedimentary shales of the Kennett-group. Much of the Kennett-cover has been eroded away exposing the underlying Balaklala formation. At the Iron Mountain property the Kennett-group is completely missing.

Massive Sulphides

Two general types of mineral deposits were found at Iron Mountain. One consisted of massive pyritic ore-bodies that locally contained chalcopyrite and sphalerite in mineable grade and quantities. The other was composed of disseminated chalcopyrite and quartz-chalcopyrite veins which occurred in schistose-like rock of the Balaklala host, often at the base of the massive sulphide zones. Within the massive sulphide bodies, those portions which contained copper and zinc mineralization appeared very little different, on visual inspection, from zones barren of copper and zinc. Most of the copper and zinc ore mined prior to depletion was found along the edges and bottom of massive sulphide zones.



PERSONNEL discussing a problem are (left to right): Robert K. Barcus, vice president and chief engineer; C. W. McClung, president; and Don Windsor, mine engineer.

A few veins of quartz-copper and disseminated copper veinlets were mined, however, which were not in immediate contact with the massive pyrite.

Faults Break Ore Into Blocks

Several massive sulphide bodies are now known to exist at Iron Mountain. From northeast to southwest these bodies have been named the Hornet and Mattie, Richmond-Complex group, Brick Flat, and Iron Mountain, which includes the Old Mine. It is thought that originally the massive sulphides occupied one continuous zone, trending northeast about 4,500 feet, and were several hundred feet wide. It seems fairly evident that the Brick Flat, Richmond, and Hornet groups were broken into blocks by post-ore faulting which trended northwest. It also appears likely that the Old Mine deposit is a faulted extension of the Brick Flat block.

The massive sulphide zones are remarkably uniform in grade and consistency. The boundaries of the deposits are very sharp and distinct. In many, the contact with wallrock is marked by a thin selvage of gouge. Gradational contacts are rare. The massive sulphides will average 90 to 95 percent pyrite; the sulphur content ranges from 45 to 50 percent. They are nearly free of silica which averages only 2 to 5 percent. The pyrite now mined contains less than 1 percent copper.

The attitude of the Iron Mountain sulphide bodies varies greatly. The

Hornet is steep-dipping and nearly vertical. The Mattie is a horizontal pipe-like structure. It has been suggested that the Old Mine, Brick Flat, and Richmond-Complex groups are or were synclinal depositions in an anticlinorium.

The new open pit was developed over the Brick Flat ore body in a saddle of the divide separating the two creeks at the northeast and southwest. This deposit was first disclosed by diamond drilling in 1949, and much of the inferred shape, attitude, and structural features was originally predicted from the drill hole logs.

Why Open Pit Considered

At the time that the Brick Flat was found, the Richmond ore body was being mined underground. Various modifications of sub-level caving and induced caving methods were in use. In general stope blocks measuring 65 by 125 feet were undercut. Caving was promoted by the use of coyote holes or long-hole drilling. The ore was then reclaimed from slusher drifts below the stope.

The ore is valuable only for its sulphur content. On the open market in

California, pyrites are sold in a price range of \$10.00 to \$15.00 per long ton. Though Mountain Copper's entire production goes to Stauffer Chemical and General Chemical, it is only reasonable to assume that Iron Mountain ore must be mined at a competitive price. Therefore, a low-cost, bulk mining method is required to meet this situation. In addition every effort was made at Mountain Copper to minimize dilution. In order to mine clean, pillars were required along the hanging wall of ore bodies and between stope blocks.

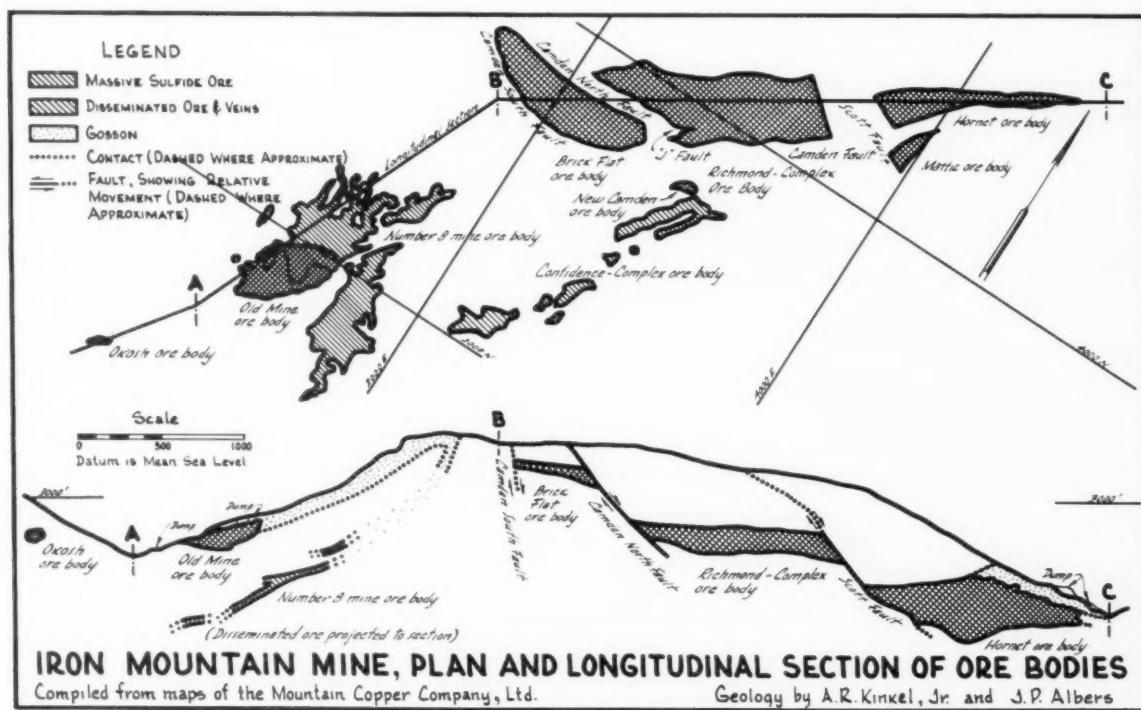
The Brick Flat deposit was located some 300 feet above and to the southwest of the Richmond. Underground extraction of the Brick Flat would have required a great deal of expensive development in order to prepare the virgin country for mining. This would have included main level haulageways as well as raise and slusher-drift development prior to undercutting and caving stopes. In addition the Brick Flat orebody was more lenticular than the Richmond; the dip of the hanging wall varied from 60° to flat. The Brick Flat hanging wall was more irregular and not as well defined as the Richmond. The Rich-

mond was 200 to 300 feet thick vertically which provided reasonable backs for a caving operation. The Brick Flat, however, thinned to 40 or 50 feet to the southwest, and this is hardly a suitable thickness for caving.

There was evidence of three major faults near the Brick Flat deposit. The close proximity of these structural features suggested an ore of different physical characteristics than prevailed at the Richmond. The evidence hinted that the Brick Flat might not lend itself so readily to caving without more problems in dilution and in control.

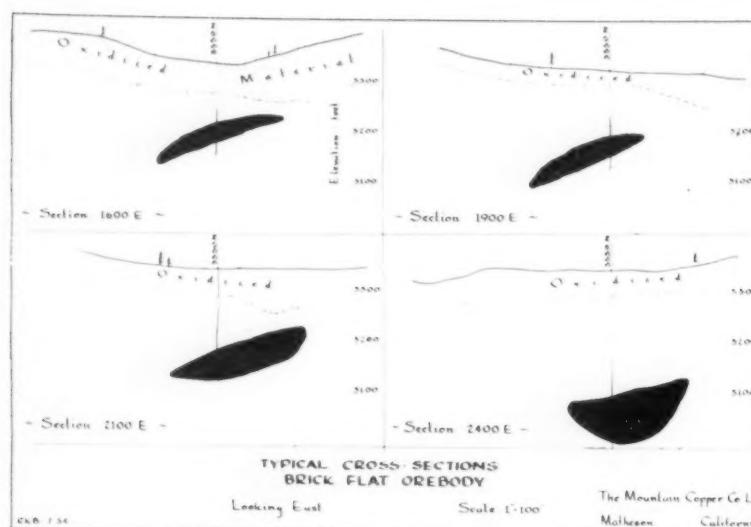
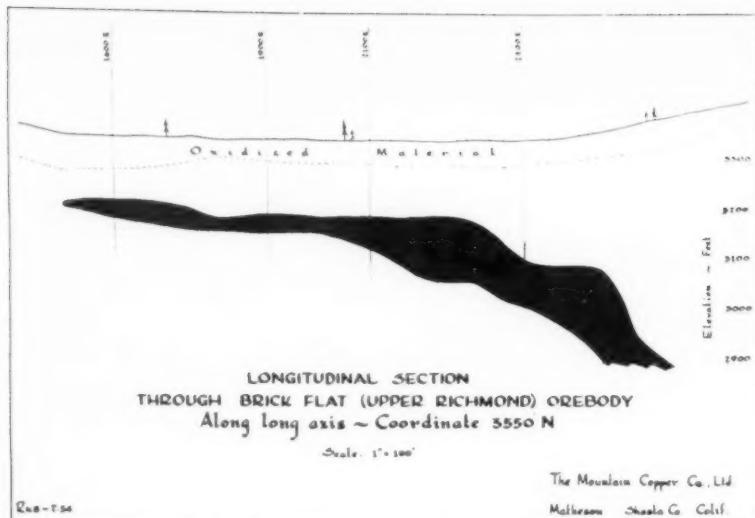
Because of these factors, Mountain Copper began investigating the possibility of recovering the Brick Flat by open pitting. Careful consideration of all aspects of the question resulted in a decision to proceed with open pit development. Even though the stripping ratio of 8-to-1 was high, it was felt that Brick Flat ore could be extracted at the same cost as underground mining at the Richmond. The open pit on the Brick Flat could be carried down so that a favorable stripping ratio would result over the upper part of the Richmond.

In the upper portion of the Richmond, a block of ore existed that had



DISTRIBUTION of deposits is shown by above map, adapted from Special Report No. 14 of California Division of Mines,

"Geology of Massive Sulphide Deposits at Iron Mountain." Note how ore is faulted into blocks.



been economically impossible to mine underground. This ore was located near the upper limb of a synclinal structure. It was considered too broken and not strong enough to support the openings necessary for a cheap caving operation. The open pit would yield greater extraction of the Brick Flat. It would enable recovery of the upper ore in the Richmond; and it would make possible the recovery of Richmond pillars. The open pit would eliminate the ever-present hazard of underground fires; and open pitting would permit greater flexibility.

How Conversion Took Place

When plans for the conversion to open-pit operations had shaped-up, the management informed labor of the

impending change. As President William McClung put it, "We asked the underground miners to name their three top preferences for jobs in the open pit. As nearly as possible, we tried to match the requests to the men. This left us with quite a training problem because none of our workers had the benefit of open-pit experience. We trained our own truck operators, and we temporarily obtained the services of a specialist to break-in our drill operators. We also had a specialist to train the shovel operators."

Mountain Copper is very proud of its stable working force. Only one or two persons have had to be hired to fill vacancies since 1950. Most of the people have been on the payroll for at least 10 years and the great ma-

jority have been on the payroll for considerably longer. Many father-son combinations are working for the company. The long tenure of each worker is a real tribute to the effective management of the company. Few firms in any field have compiled with an outstanding record.

Water Problems

As mentioned previously, the location of the open pit immediately posed a drainage problem. The only way this could be handled was to incorporate an open end in the pit even though the topography provided little incentive for this plan. Maintaining the open end meant moving additional waste for the cut containing the access road. The access road to the pit must be constantly lowered as mining goes deeper. Drainage slopes on the pit bottom and benches must be maintained to the road-cut at the pit-entry.

The ground is so wet that powder in waterproof cartridges must be used for blasting purposes. Prilled, fertilizer-grade ammonium nitrate, poured in blast holes, is not suitable due to the water problem. Once the deposit was exposed, stripping and mining were conducted simultaneously. Present and future stripping activities must be planned, however, so that equipment can be moved out of the upper, badly oxidized portion of the overburden and into more firmly silicified overburden before the onset of the rainy season. The oxidized zone extends to a depth of about 120 feet, and it turns to a sea of mud under the pounding of equipment when it rains.

Mining

Loading equipment includes a 4½-yard, Bucyrus Erie, electric shovel and a 1½-yard, Bucyrus Erie, Diesel shovel. The electric shovel is used exclusively for handling waste. The smaller shovel is used for loading ore and for tight stripping adjacent to the hanging wall. The haulage fleet is composed of 6 model 36 TD Euclid trucks rated at 22 tons capacity each. The trucks are equipped with 300 horsepower Cummins Diesel engines, torque converters, torqmatic transmissions, and Euclid retarders.

A Joy, model 58BH, Heavyweight Champion rotary drill puts down 7½-inch holes in the overburden. This machine is used only on waste benches. A Joy Challenger drill on a TWMS, self propelled, four-wheel carriage is used on ore benches. The Challenger,

a percussion machine, bores a 3½- to 4-inch blast hole. Drilling and motive power for the Challenger are furnished by compressed air. The crawler-mounted Heavyweight Champion is powered electrically. These are the primary units at the mine. The mine is worked one shift each day, five days a week. Each day the crew works ½-shift on waste then switches to ore production for the remaining ½ of a shift.

Benches in waste are established at 40-foot intervals. In ore, bench height is 15 feet. The orebody is uniform in grade and character, except near the hanging wall where it is higher in silica. The ore is very hard and dense, and is extremely abrasive. Tungsten carbide, 4-inch bits are used with 2-inch round steel on the Challenger drill. Total bit life averages approximately 137 feet. The bits, however, average only 9 feet or a little better before regrinding. Each bit is generally reground 13 times and used 14 times before it is discarded. Average footage drilled in ore per-drill-shift is 80 to 90 feet. Two Ingersoll Rand wagon drills are used periodically for pioneering work about the mine. Other auxiliary equipment includes two Caterpillar D-8 bulldozers, and a Caterpillar No. 12 motor grader, and two Ingersoll Rand Gyroflow compressors rated at 600 cubic feet per minute.

Blasting

Waste is blasted with fertilizer-grade ammonium nitrate in 6½- by 40-inch water-proof cartridges. The charge is detonated by means of primacord and a primer cartridge. The ore is blasted with ammonia dynamites in 3- by 16-inch cartridges. Blast holes in ore are spaced on 6-foot centers. The powder factor for ore is 0.75 pounds of explosive per ton of ore. Breakage in ore amounts to 5 tons per-foot-of-hole.

Drilling and blasting the hard, dense, Mountain Copper ore accounts for about half the cost of mining. The ore breaks quite blocky with the resultant formation of angular, sharp chunks. This is quite hard on hoses, electric cables, and tires. Some secondary breaking is required to shatter large lumps. Fracture systems and joints in the ore are the primary contributing cause to the formation of blocks when ore is blasted.

The great relief of the area provides practically unlimited disposal volume

for waste. Overburden is hauled a maximum of 1,100 to 1,200 feet (one-way) to the present dump point. The present waste disposal area is located near the entrance to the mine, and the waste haul will always be considerably less than ½-mile.

Remodeled Crushing Plant

The ore haul amounts to 9,000 feet over a maximum 7½ percent downgrade to the new crushing plant located near the old Richmond mill. This mill was built in 1943 and operated for a few years to recover copper and zinc from the Mattie orebody during World War II. It was subsequently abandoned with depletion of the copper-zinc reserves at the Mattie.

The crushing plant at the mill was remodeled in the 1955-1956 period to serve the requirements of open-pit production. This consisted principally of installing a truck hopper, an apron feeder and a large jaw crusher. The plant was designed to crush mine-run ore to minus ¾-inch in three stages. It will handle daily ore output of 400 tons in 3½ to 6 hours. The tramway, however, limits capacity to 50 tons per hour. To combat corrosion, a great deal of stainless steel was used in bins and hoppers in the crushing plant. The tramway buckets are lined with stainless steel. The ore is very hard and wear rates are high. Jaw crusher plates are reversed after handling 70,000 tons.

The 22-ton-capacity ore trucks dump their loads into a 50-ton-capacity coarse ore hopper. A 48-inch by 14-foot Telsmith apron feeder draws the ore from the hopper and discharges it to a 36- by 42-inch Birdsboro jaw crusher. The drive between the motor and the crusher is furnished by Polly V belt. The crushed product is conveyed to a 700-ton-capacity concrete bin. At this point a 36-inch Telsmith feeder delivers the crushed ore to a conveyor which discharges to a screen ahead of the 2-foot 4-inch Traylor gyratory crusher. The minus 1½-inch screen undersize joins the product from the secondary crusher and is conveyed to a 5- by 10-foot Tyler screen with ¾-inch square mesh openings in the deck. The Tyler screen is mounted on a 30° slope, so the effective aperture of the deck is ¾ inch. It is in closed circuit with a Symons cone crusher, which receives the screen oversize. The undersize from the Tyler screen is conveyed to the ore-storage building which provides about 2,500 tons



HAULAGE FLEET is composed of 6 Euclid trucks, model 36 TD. Each carries about 22 tons of ore.



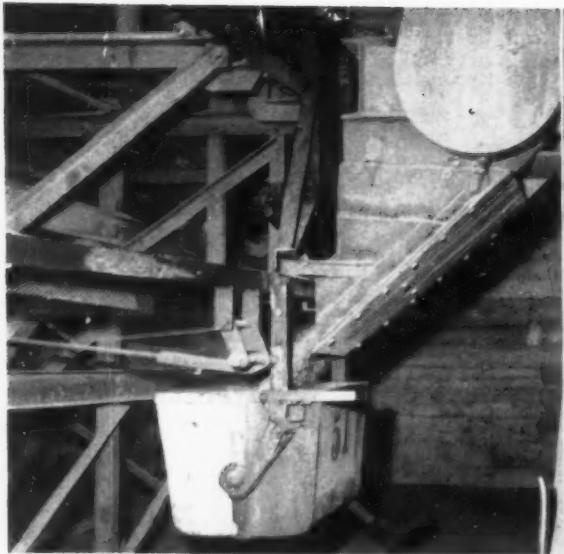
ORE HAUL to 3-stage crushing plant is about 9,000 feet over a maximum 7½ percent downgrade.



REMODELED crushing plant breaks pyrite ore to minus ¾-inch size in 3 stages. Abrasive ore causes high wear.



RIBLET TRAMWAY delivers 50-tph of ore from crushing plant to unloading terminal at railroad, 18,000 feet away.



TRAMWAY features automatic loading and unloading terminals. Photograph shows a bucket being loaded after it has been spotted under the chute. The gate is opened and closed, bucket weighed, and attached to traction cable automatically.

of surge capacity ahead of the tramway loading terminal.

Ore-Storage Building

The ore-storage building consists of the former ball mill bay of the old Richmond mill. The grinding bay had a concrete deck. To convert it for ore storage, a reclaiming tunnel was driven at right angle to the long axis of the building. A drawpoint was installed in the deck at the center of the building and connected with the reclaiming tunnel.

The final crushed product is delivered to the ore storage building by means of a fixed conveyor which enters near the top of the former grinding bay. This conveyor is oriented perpendicularly to the long axis of the building and the discharge end of the belt is spotted above the drawpoint in the deck. A slusher set-up in the building is used to periodically scrape the ore away from the stockpile under the conveyor and distribute it along the length of the deck. Conversely, if the crushing plant or mine is down, the slusher reclaims stored ore for the tramway.

Tramway Extension

The tramway was engineered and designed by Riblet Tramway Company. The original installation, completed in 1922, was about 3 miles long, and it provided transportation from a point near the Hornet mine to a Southern Pacific Railroad siding on



feet to the discharge terminal. It is a continuous bi-cable type. The track cable is 1½ inches in diameter on the loaded side and 1-inch in diameter on the return side. The traction cable is ½ inches in diameter. The installation contains 92 buckets, each possessing a capacity of ½ tons. The tramway traction cable travels at 450 feet-per-minute. A round trip requires one hour and 20 minutes.

Both the loading and discharge terminals are completely automatic. A series of track switches spaced at intervals around the carrier track at the terminals operate time-delay relays which, in turn, actuate the equipment governing the loading or unloading cycle. Buckets are counted electrically.

At the upper terminal, returning empty carriers hit a track switch as they are automatically detached from the traction cable. The track switch operates a braking mechanism. The bucket is brought to a stop by a brake arm which bears against the carrier wheels. A pre-set time relay releases the brake and the bucket is automatically conveyed around the carrier track to the loading chute. As the bucket is traveling to the loading chute it trips more track switches operating pre-set time relays. The carrier is automatically spotted under the loading chute; the belt feeder is started and stopped automatically; the bucket is automatically weighed, moved out, and attached to the traction cable.

At the discharge terminal, track switches and pre-set time relays govern the cycle in a similar manner. The ore, dumped in a storage pile, is loaded into railroad cars by means of a conveyor. In the loading position the cars are spotted on a track scale. Loaded and empty cars are moved by means of an electric continuous cable car puller designed on the Koepe hoist principle.

The Iron Mountain operations of Mountain Copper have taken on a new look in the past three years. As pointed out earlier, few would have undertaken open-pit development without experienced personnel and have done it so successfully.

A large share of the credit should go to the able staff which includes C. W. McClung, president; Robert K. Barcus, vice president and chief engineer; Don Windsor, mine engineer; W. H. Calhoun, mine superintendent; Ben Jackling, master mechanic and chief electrician; Floyd Serpa, general surface foreman; V. H. Dahlgren, tramway foreman; and L. A. George, office manager.

THE END

CHECKING COMPRESSION of steel sets is necessary so that they yield while maintaining circular form, rather than deforming. This miner has found and points to a projecting rock which must be removed so that set will yield.



How Yieldable Steel Sets in Heavy Ground Save Money at Western Mines

By G. M. HUCK

Controlling heavy ground with yieldable arches is fast becoming an accepted practice in western metal mines.

The yieldable steel arch has many advantages over wood or rigid steel supports if it is installed correctly, and at some mining operations, correct installation of the arch is assured by training men on the surface.

The advantages of the yieldable arch over the wood or rigid support are numerous. It is not uncommon to see a steel yieldable arch set standing in bad ground which formerly would snap 18-inch diameter timbers or buckle a rigid set.

Mr. Huck is manager of Tool Steel and Special Product Sales, Bethlehem Pacific Coast Steel Corporation.

The yieldable arch is specifically designed for bad ground. In the west, it has been installed in ground where heavy pressure was imminent either as a natural cause or because drifts were penetrating older workings and fractured ground. In certain installations, yieldable sets are used as permanent installations. In others, they can be recovered after mining operations ceased and returned to service in new development with very little maintenance. Mines have reported recovering up to 98 percent of these arch sets.

Steel superiority over wood begins with storage. The steel sections are easily nested. Being uniform, they take up little extra space and have the added advantage of ease in handling and transportation. Once installed they require a minimum of maintenance. However, they should be in-

spected regularly to make sure arches are yielding and not deforming.

The design of the section also allows it to be canted or twisted out of the vertical plane and still retain a great percentage of its original beam strength. Ordinary I-beams and H-beams lose their strength very quickly when subject to eccentric loading. The rigid arch's greatest handicap is its tendency to shear the back strata, dissipating much of the formation's inherent strength. The yieldable arch, on the other hand, actually assists the back into forming its own natural arch.

Cut Cost in Nevada Mine

In the west, the yieldable sets are most popular in extremely bad ground. In one Nevada mining operation the sets are used in slusher drifts in a porphyry copper mine. This rock is

fairly hard until it is opened up, then it becomes heavy and difficult to hold. Timber in this same formation is replaced about every six months to keep the mine operating at peak efficiency. The superintendent is currently keeping a careful record of the performance of the yieldable ring sets compared with timber. Steel ring sets are installed on 2-, 3-, and 4-foot centers. The distance between centers is governed entirely by conditions underground. According to the superintendent, contracting to install the steel sets would cost approximately \$150.00 per foot as against \$78.00 per foot for timbering. But it would cost the company another \$200.00 per foot every six months to replace the wood sets. Because of the marginal nature of this mining operation, ore withdrawal must be kept at a maximum of efficiency and uniformity. The steel sets are installed

in areas that must be kept open for longer periods than six months and are adding to the economy and safety of the operation.

This mine also maintains a training area on the surface to instruct miners in the fundamentals of installing and bolting the steel rings together. The surface classes take very little time, and men are thus familiarized enough so time loss is avoided when conditions underground call for their installation. The importance of proper tightness of the nuts on the U-bolt clamps cannot be overemphasized, for in order to be effective, the arch must be permitted to yield. Too tight a connection defeats the purpose of the design.

Careful Tightening Necessary

The nuts on the U-bolts should be tightened to approximately 180 foot-

pounds of torque for arches. Where a ring set is used the lower yieldable section, which will be buried under the muck, will need only 150-foot pounds of torque. Until operators are familiar with installation and the fitting and bolting procedure, installations underground should be checked as soon as possible on completion or while under development. The openings between the sets should be tightly and uniformly lagged. Care should be taken to insure uniform tightness of U-bolts. Obstructions such as projecting rock or lagging which would prevent joints from yielding should be removed. If this is performed, yieldable arches are almost indestructible.

When a set has been in place over a period of several weeks in normally heavy ground with marked subsidence and the yield is not apparent in some of the joints, the yielding action may often be initiated by sharply pounding overlapping joints with a pick. If one side of an arch or ring is yielding and not the other, this same procedure should be used to permit the latter to adjust as uniformly as possible. Yieldability of the arches is easily noted by chalk marks indicating the last position of the end of the overlapping sections.

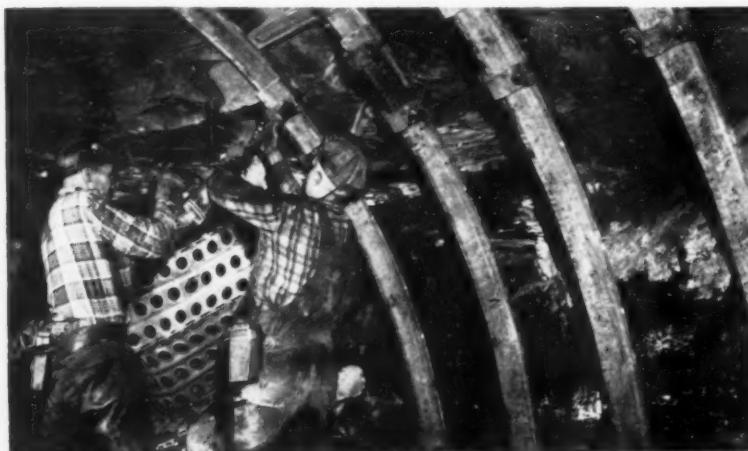
The principle of the yieldable arch is in the U-shaped rolled-steel segments which are heavily flanged to resist torsion and designed to nest one into another at their points of overlap where they are clamped together with heavy U-bolts. It is at this joint that torque pressure on the nuts should not be too tight. At 180-foot pounds of torque, the joints are drawn tight enough to hold fast under normal loads; but when unusually heavy pressures are exerted by the ground, the nested segments are allowed to slide or yield before deformation of the steel takes place. With the load relieved, the structural continuity of the arch is maintained. The resistance of the arch after yielding is augmented by the increase in overlapping at the joints, and in most formations, it permits the overburden to form its own arch. Actually, the more the arch yields the stronger it becomes.

Adjusts To Ground Pressure

One of the main advantages of a yieldable steel set over wood or rigid steel sets is its self-adjustment to ground pressures. A wood set must be taken out frequently in heavy ground so that excessive pressures can be relieved by removing material, then the wood set and lagging are reinstalled. This practice, of course, lends no



REPLACING TIMBER sets with steel sets in this main haulage drift. The invert sections are placed first which necessitates muck removal below track grade. These 12-foot-diameter rings are on two-foot centers.



IMPACT WRENCH is used to properly tighten bolts on this steel set being installed in western coal mine. Great care must be used to tighten each bolt uniformly, 180 foot pounds of torque for arches.

stability to the particular area of ground. Often frequent pressure relieving merely accelerates future subsidence.

When properly installed, however, the yieldable steel set relaxes only as back and/or side pressures overcome the frictional resistance of the sliding sections.

The U-shaped rolled section of the Bethlehem Steel Company arch is made of high tensile strength steel, approximately 75,000 pounds per square inch. The two moments of inertia of the section are similar—thereby offering great resistance to buckling and torsional stresses. Most of the sections now in use weigh 15 pounds per foot. However, Bethlehem is now making a heavier, 21-pound-per-foot section.

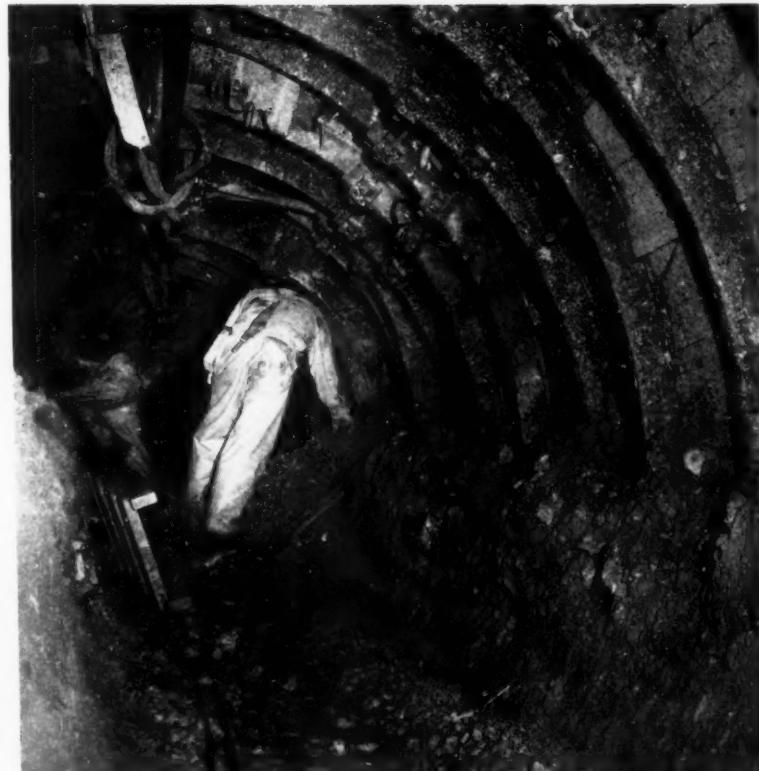
The Bethlehem yieldable arch used as a permanent installation makes for good housekeeping while providing the added security of easy maintenance and safety.

Holds Through Rock Bursts

In one western coal mining operation, 15-foot-wide yieldable arches are used on a 116-foot stretch of ground in a main haulageway which is occasionally subjected to severe "bouncing" or "rock bursts." The steel sets were installed after the area had suffered a shock which nearly closed the haulageway and required several months to clear.

In this same mine an air course is supported by yieldable steel arches on 2-foot centers. The slope roof is heavily cribbed leaving voids between the overhanging shale and the steel arches. The cribbing is placed in such a manner as to distribute the roof pressure evenly along the entire perimeter of the arches. In six months, these arches have yielded approximately 2½ inches. The area is below older workings that at one time were completely flooded, and in some areas, the ground is badly caved.

The use of the yieldable arch in bad ground and the close records that are being kept on this type of support in many mining operations will help to popularize it for use in controlling unpredictable ground conditions. Mine operators also have commented on the streamlined and space-saving features of the yieldable arch. Underground, they allow for more head room and better ventilation; yet, because of the smaller cross section, the actual opening to accommodate them doesn't have to be as large as for conventional timbering. **THE END**



SLUSHER DRIFT in Nevada copper mine where Bethlehem steel sets have been used for over eight months. Normally these sets are reclaimed after ore has been pulled. Lagging shows how heavy ground is.



SURFACE TRAINING CLASSES use these yieldable arch sets at Nevada mine. Miners are given four hours of instruction in the proper installation and care of sets. Proper fitting and tightening of bolts is necessary for sets to yield.

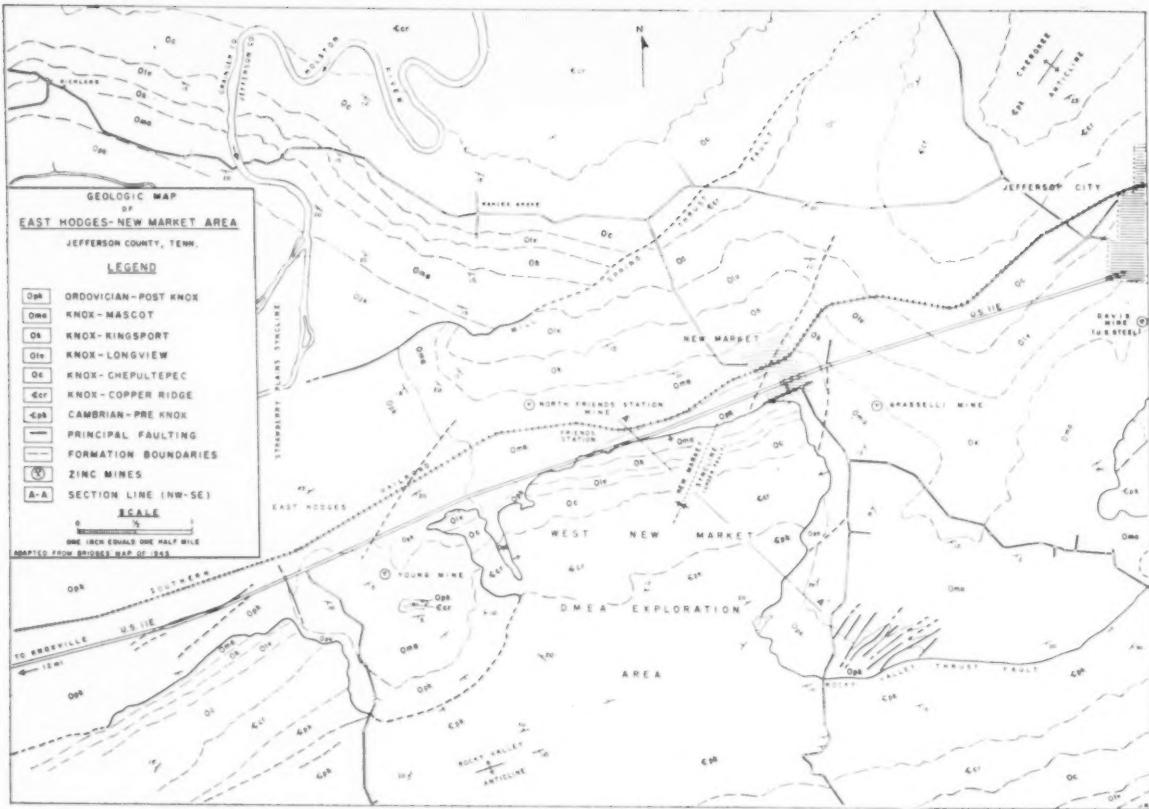


PLATE I. A surface geological map of East Hodges-New Market area in eastern Tennessee where one of most successful DMEA exploration projects was completed by American Zinc

Company of Tennessee. Surface drilling proved large zinc reserves.

How American Zinc's Tennessee DMEA Program Proved 35,000,000 Tons Ore

By CHARLES R. L. ODER

American Zinc Company of Tennessee has completed one of the largest and most successful Defense Minerals Exploration Programs. It is the West New Market Exploration project in Jefferson County, Tennessee.

Drilling of 316 vertical holes from the surface indicated more than 35,000,000 tons of minable zinc ore. Of perhaps equal but longer range importance, this drilling yielded geological information on which to base further exploration in the area.

Mr. Oder is chief geologist for the American Zinc Company of Tennessee with headquarters at Mascot. His many years of experience in the area make him an expert on the Tennessee zinc deposits.

The project embraces approximately 7,800 acres of land in a rather compact block which extends from New Market southwestward for 3.5 miles and from the Southern Railway southward for nearly three miles. Its location is shown on Figure 1 and Plate 1.

See May Issue for DMEA To Date

This is the first Case-History article on successful exploration projects under DMEA assistance. More are scheduled for *Mining World*.

The Capitol Concentrate section on page 9 of this issue outlines the critical situation facing DMEA. For a complete record of DMEA accomplishments, please see the special article in the May issue of *Mining World*, page 42. The record justifies extension by law.

This project constitutes about the eastern 60 percent of the South Friends Station Development area in which the American Zinc Company of Tennessee started exploratory drilling in 1950. No surface exposures of metallic mineralization were known in the area, and, through most of it, the rock zones from which zinc ores were being mined in adjacent territory are deeply buried beneath the Rocky Valley overthrust fault. Nevertheless, study of the regional geology led to the belief that the ore-bearing rocks would be found in the footwall of the fault under circumstances favorable to the occurrence of commercial ore bodies. Thus, the selection of the ground for exploration was based on geological deduction.

A large ore body, now in production by American Zinc as the "Young

mine," was outlined between 1950 and 1953 by surface drilling in the western part of the South Friends Station Development area. After that discovery the eastern 60 percent of the area became the West New Market Exploration Project most of the exploration of which was performed under a contract between the American Zinc Company of Tennessee and the United States Government's Defense Minerals Exploration Administration.

The purpose of this article is to describe the latter exploration and to briefly discuss the occurrence of the ore it revealed.

Zinc History From 1892

Mining of oxidized zinc ores began in 1892 one mile southeast of New Market where the Grasselli Chemical Company started producing "carbonate" in 1910 and shortly afterward developed a sulphide body which became the Grasselli mine of the American Zinc Company.

The territory north of the railroad, between New Market and Friends Station, was variously explored be-

tween 1892 and 1943. During the latter year American Zinc found its currently producing North Friends Station mine.

Development of the zinc deposits in the Mascot-Jefferson City district was stimulated by Arthur Keith's Maynardville Folio¹ in which he described the local general geology and clarified the geologic structure. Recent exploration has been aided by Josiah Bridge's geologic map² of the district on which the features mapped by Keith are detailed. Plate I is an adaptation of that part of Bridge's map which covers the Friends Station-New Market segment of the district.

Geologic Setting

The pertinent area lies within the Tennessee division of the Appalachian Valley which has long been known to be underlain by folded and faulted rocks of Paleozoic age. The local formations are composed of limestones, shales, and sandstones which range in age from the lower Cambrian to the middle Ordovician period. They have been described by many authors and, therefore, their general character

teristics, given in Table 1, are believed to serve present purposes. No igneous rocks are known in the area.

The regional geologic structure is complicated by irregular, distorted, and broken anticlines and synclines, as shown on Plate 1.

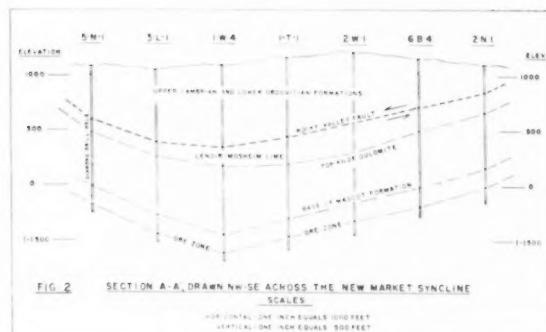
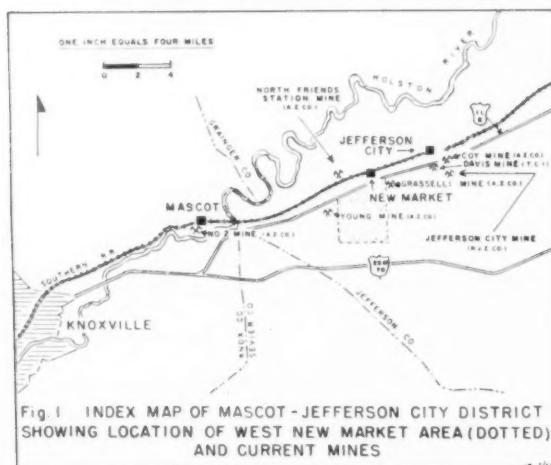
East of New Market the axis of the Cherokee anticline strikes nearly south but three miles to the northeast it assumes a trend of N. 40° E. and holds it for several miles in that direction. The west limb of this fold is adjoined by the New Market syncline, much of which is submerged beneath the Rocky Valley fault. This is a broad and shallow fold, parts of which are represented by remnants of the Lenoir limestone projecting from beneath the fault south of New Market. Its axis appears to strike S. 25° W. but it is irregular and offset by minor tear and thrust faulting.

One of the most irregular and indistinct folds is the Friends Station

1. Keith, Arthur, 1901, U. S. Geological Survey
Atlas, *Maynardville Folio* No. 75.

² Bridge, Josiah, 1945, Tennessee Division Geology, *Geologic map and structure sections of the Mascot-Jefferson City zinc mining district*.

the Mascot-Jefferson City zinc mining district of Tennessee.



Generalized Columnar Section East Hodges-New Market Area

anticline which adjoins the west side of the New Market syncline. Near Friends Station its south limb strikes about N. 70° E. and dips to the southeast. Approximately 1.5 miles northwest of Friends Station it is twisted to the northwest and truncated by the Mill Spring thrust fault. The block of Copper Ridge dolomite 1.5 miles northeast of Friends Station is probably a part of this anticline which has been broken and obscured by this fault.

The dome in which the Young mine is situated, south of East Hodges, looks like a branch of the Friends Station anticline. Its southeast limb dips into the New Market syncline and its northwest limb into an eastern protuberance of the Strawberry Plains syncline.

One of the outstanding and important structural features is the Rocky Valley overthrust fault which extends through the entire area. Its general strike is northeast-southwest, with a gentle dip to the southeast; but, it is folded which causes variations in strike and dip. Arthur Keith estimated the shortening caused by this fault to be 2 to 2.5 miles. The stratigraphic displacement amounts to 4,700 feet, or more, placing lower Cambrian on middle Ordovician beds. Throughout the West New Market area, the fault plane rests on the Lenoir limestone. Most of the ore bodies occur in the footwall of this fault. The Mill Spring overthrust is steeper, of less magnitude, and of less obvious importance to the ore occurrence than the Rocky Valley.

Arthur Keith stated that the large, sub-circular Strawberry Plains syncline, west of East Hodges, indicates pressure from all directions. This opinion seems to be supported by the distortion of nearly every fold in the area. Some of the structural complexity may be due to the application of pressure through two or more periods of orogeny, evidence for which will be given under the discussion of ore deposits.

DMEA Exploration Program

After putting down 41 widely scattered diamond drill holes in the area, the company applied to the Defense Minerals Exploration Administration for aid in financing the West New Market project. The application proposed 450,000 feet of exploratory surface drilling. The holes were to be drilled on a grid system planned by the company's geologists. The earlier (wildcat) holes were 1,200 feet apart, with intervening holes to be drilled where and when they seemed justified. No holes were to be spaced closely enough to block out assured ore.

Work performed under the DMEA contract started on July 5, 1954 and it was completed on October 29, 1956. It consisted of drilling from the surface 316 vertical holes the depths of which varied from 573 to 2,243 feet. A total of 450,311 feet of hole was completed, all but 487 feet (churn drilling) of which was cored with an AX diamond bit. Through most of the project, 10 diamond drills were operated double shift, with the third shift being added during parts of the winter season. The job was executed without serious interruptions. No holes were lost. Core recovery amounted to 90 to 100 percent, yielding excellent samples. The drilling was contracted to the Joy Manufacturing Company, at an average cost of \$2.10 per foot.

The locations and sea level collar elevations of all holes were surveyed and plotted on 300-scale maps by company engineers. The core was logged and sampled by company geologists. Sludge was not sampled. No core was split. Each sample consisted of the total core from the part of the hole it represented. All samples were assayed in the company's laboratory at Mascot, with a number of assays being checked in other laboratories.

Results of the Exploration: This program demonstrated the existence of zinc sulphide mineralization of minable thickness and grade in localities which occupy a majority of the project area. Only comparatively small parts of the area remain untested by at least widely spaced holes. Twenty-seven percent of the holes found minable ore, 42 percent of them found indicative non-commercial mineralization, and 31 percent of them are blank. Actual measurements show that more than 35,000,000 tons of minable material were indicated, most of which is in large bodies.

The exploration yielded an abundance of economic and scientific information. It revealed geological relations which prove that zinc mineralization, under circumstances favorable to the presence of commercial ore bodies, is widespread in the area, and that there remain strong possibilities of substantially expanding the known ore reserves. Also, it showed that the ore is amenable to economical extraction and that the area is worthy of further development.

The Ore Deposits: The general character of the ore is similar to that of known deposits in other parts of the Mascot-Jefferson City district. Sphalerite is the only ore mineral. Occasionally it is accompanied by small amounts of iron sulphide. The principal gangue consists of white crystalline dolomite and the moder-

ately cherty country rock. Calcite and quartz are sparingly present.

Zinc mineralization was found, intermittently, through a stratigraphic range of 611 feet, in the group of rocks known as the Knox dolomite (see Table 1). It extends from the upper Longview to well above the middle of the Mascot formation. The majority of the commercial ore is in the lower part of the Kingsport. A few holes showed it in the Mascot and, since it has actually been blocked out in this formation in neighboring localities, it is felt that further exploration may lead to its being mined in the West New Market area. Although mineralization in the Mascot has long been known, the Friends Station-New Market area is believed to be the first part of the district in which it has been found in commercial bodies.

In grade and features of localization, the West New Market ore is quite similar to that being mined in the nearby Young, Grasselli and North Friends Station mines, but less like that in the vicinity of Jefferson City and some of that at Mascot. Most of the mineralization forms fillings in fractured and brecciated fine to medium grained dolomite. A lesser amount of it occurs as replacements of coarsely crystalline dolomite, which is an alteration of high calcic limestone and which locally is called "recrystalline." This rock type contains a considerable proportion of the ore in other parts of the district.

Blank, or sparsely mineralized, recrystalline frequently is overlain by intensely shattered and well mineralized fine grained dolomite at West New Market. The majority of the ore-bearing recrystalline is fractured and brecciated, which not only indicates that it is older than the fracturing but also suggests that its mineralization depended upon the fractures as access channelways.

One of the surprises revealed by the diamond drilling pertains to the Rocky Valley fault. Prior to the exploration, this structure was believed to have formed late in the period of deformation, and it was considered as a possible channelway for the mineralizing solutions. However, many cross sections, based on drill hole information, such as that in Figure 2, show that the fault is folded. Through the entire area, it remains parallel to the stratification of the formations involved in folds beneath its plane. Instead of maintaining a south dip, as indicated in Josiah Bridge's cross sections, it dips westward in the eastern and eastward in the western part of the area, paralleling the limbs of the New Market syncline. Thus, it appears that the fault is older than

the last deformation of the folds, suggesting either a continuation or a subsequent surge of the causal pressure.

Although 27 drill holes showed zinc sulphide in the hanging wall, varying from 32 to 720 feet above the fault plane, no mineralization was observed anywhere in the gouge or fracturing associated with the fault. The hanging wall sphalerite is in older formations which are known to contain similar mineralization in a number of localities in East Tennessee. This implies that the Rocky Valley fault may be younger than the zinc mineralization. If it is older, its plane must have been impervious to the mineralizing solutions.

The rocks of the district bear the following evidence of either two or more periods of orogeny or intermittent applications of deforming stresses through a very long period of time:

1. An erosional unconformity, with considerable relief in places, at the top of the Mascot formation. This feature indicates that orogenic movements started no later than the earlier part of the Ordovician period.

2. The folding of the Rocky Valley overthrust which, also, is broken and offset by later faulting.

3. The mashing of folds and the twisting and branching of their axes, such as the Friends Station anticline into its northwest arm and its southwest branch represented by the Young mine dome.

4. Minor flexures, which, in some

of the mines, are shown to be involved in later folding and fracturing.

5. "Dry Breccias", so called because they rarely are mineralized, which are cut by the mineralized fractures and breccias.

6. Minor faulting which displaces older faults and cuts across both the zinc-bearing and the older breccias, sometimes offsetting ore shoots.

No zinc minerals are known in rocks younger than the Lenoir limestone in which they occur as disseminated traces, unrelated to fracturing. They could represent the products of erosion of the Knox dolomite or older rocks. Therefore, it seems likely that the concentration of zinc sulphide in the Knox took place some time after the beginning but before the end of the long period of deformation.

Most of the ore bodies are large and ramiform, resembling asymmetrical networks in which the ore shoots form interconnected channel-like branches between and within which are found irregular areas of non-commercial rock, locally called "blank islands."

The so called "blank islands" usually contain some non-commercial mineralization; but, most of them are lightly fractured and the limestone layers within them are less altered to dolomite than those in the ore shoots. Apparently, the more intense shattering of the rock in the ore shoots was caused by differential bedding plane movements which fractured and rubbed the strata but seldom produced obvious local folds and faults or other

useful structural controls. Such movements probably were facilitated by gentle formation dips and their loci of intensity were determined by those parts of the strata where the greater degree of dolomitization of the limestone zones had taken place, where voids had been created by solution and by buckling, and where other older structures existed.

Acknowledgement

The author is grateful to Messrs. Howard I. Young, president of the American Zinc, Lead and Smelting Company, and C. O. Mittendorf, administrator of the Defense Minerals Exploration Administration, for permission to publish this paper. It has been a pleasure to work with Mr. Harley A. Coy, vice-president of the American Zinc Company of Tennessee, who generously approved this publication. The writer enjoyed splendid cooperation from Mr. Robert A. Laurence, executive officer of the DMEA Field Team, Region V, and his associates. Thanks are due Mr. James E. Ricketts, assistant chief geologist of the American Zinc Company of Tennessee, for drafting the illustrations and for able assistance in the execution of the project, and to the following company geologists who contributed to the success of the exploration: Messrs. George C. Russell, E. L. Johnson, James G. Bumgarner, Sidney M. Cameron, Webster F. Stickney, Paul L. Moosmiller, and Keith G. Quarles.

THE END



WOODED RIDGES and gentle fields form typical surface pattern of the West New Market area. Twenty-seven percent of holes in the area found minable ore.



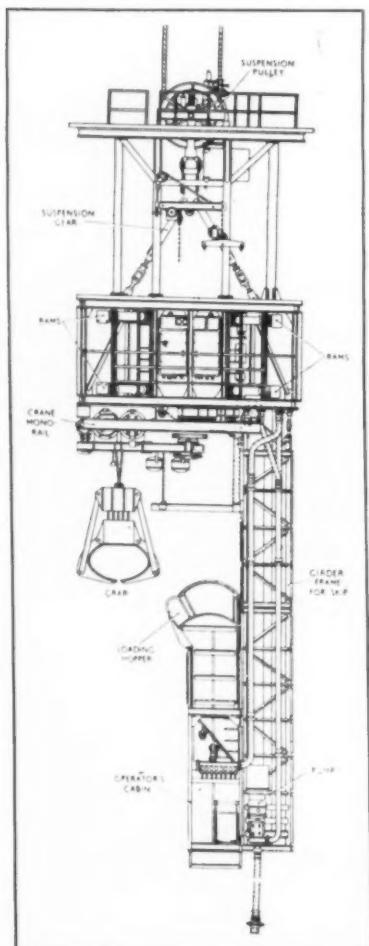
JOY, TRUCK-MOUNTED, No. 22 HD core drill at work in the West New Market area. A total of 450,311 feet of hole to depths from 573 to 2,243 feet cost an average of \$2.10 per foot.

Soviets Mechanize for Fast Sinking While Developing Radical New Methods

By DR. GEORGE ROSU

The results of my careful analysis of mining methods, mining equipment and its performance in the Soviet Orbit were carefully documented in the February 1958 issue of *MINING WORLD*. My conclusions were that the Soviets were definitely behind the Western world in mining methods, equipment design, production capacity, mechanization, and machines which could take rough, tough operating conditions without break downs.

However, a continuation of my studies shows that the Soviets have made notable strides in shaft sinking.



RUSSIAN PGA shaft sinking equipment supplements earlier PG unit. From U. K. Coal Board Mission.

Though they are again copying many ideas, methods, and equipment from Westerners, they have shown more imagination and have experimented with sinking machines not considered practical in the Free World. Careful study of records of their shaft sinking quickly shows that man power is used prodigiously, there is no such thing as "Safety First," and fast sinking was more for the record than to save money. Now for some details of the Soviet Orbit.

Mechanize Shaft Loading

Grab loaders are increasingly displacing hand loading in shafts. The use of two balanced grabs is being recommended as preferable to loading with one grab that covers the entire shaft bottom as well as the use of several grabs working simultaneously.

Equally important is the hoisting problem which, in shaft sinking, plays a far more essential role than in normal mine production. Unlike drifting, excavation is arrested or retarded in shaft sinking by a deficient hoisting operation. Hence the tendency to correlate, from the outset, the capacities and performances of the implements used in digging, loading, and hoisting in shaft sinking as well as to plan these three phases as one single operation. By way of introduction, it can be said that the frank admission of failures in planning of mining mechanization as well as of the bunglings caused by political and bureaucratic interference prior to the recent reform in the Soviet industrial management showed a keen awareness of problems still unsolved, and a willingness to learn, and try out everything new discovered in the West.

Soviet Grab Loaders

Of several types of grab loaders built in the Soviet Orbit, here is a detailed description of the LCh-335 type manufactured in Poland. It consists of a grab, a pneumatic hoist, and a steering gear. The grab's four arms swivel on the welded casing, in which are located the cylinder and piston. The casing is suspended on the pneu-

matic hoist which controls the grab during loading by means of arms and a universal joint. The pneumatic hoist and grab arms are actuated through two air valves which, in turn, are controlled by two rotary levers fitted to the steering gear. The LCh-335 is used in shafts up to 16.4 feet in diameter, and is operated by two men. The technical details of this loader are: grab capacity, 0.13 cubic yard; performance, 10.4 cubic yards per hour; maximum height, 22 feet; and weight, 1,210 pounds.

The hoist has these particulars: motor power, 15 horsepower; tractive force, 2,200 pounds; drum diameter, 9.4 inches; rope speed, 1.48 feet per second; length, 6 feet; and weight with motor, 2,464 pounds.

In the Soviet Union there are several types of shaft sinking equipment developed so far that are briefly described here. In the initial PG model, the grab shifted along a rail pivoting around the axis of the platform. This installation weighed approximately 15 metric tons, and used grabs of 0.65 cubic yard capacity. The PG type was discarded in favor of an improved version, the PGA shaft sinking unit.

During five years of experimenting, no less than three PGA models have been developed, of which the last one has now been programmed for mass production. It is roughly based on the principle of the South African installation, and consists of three platforms or decks. The top platform is used for suspension, the middle one serves as a skip landing, while on the bottom platform is mounted the winch which operates as in the discarded PG model. Characteristic for PGA is its skip hoisting and loading. This model weighs 25 metric tons, and uses a grab of 1.1 cubic yards capacity. The PGA performance is officially rated at 165 to 200 feet of shaft 21 feet in diameter sunk monthly to a maximum depth of 2,230 feet.

The KPGA type is a heavier version of the PGA, and has also three platforms joined by a central tube through which is manipulated the grab loader. The latter is emptied into the skip which starts from the level of the second platform. On the top platform is mounted the winch. The KPGA

uses a grab of 3.2 cubic yards capacity with two arms which, when opened, equal the diameter of the shaft. The whole installation weighs 82 metric tons.

Copies of South African?

There are two additional models of Soviet shaft sinking units that, in fact, look like mere copies of the South African type. The KS-1 consists of a cage with five platforms, joined by means of two tubes through which the skips travel. On the bottom platform the hoists and steering gears are mounted, through which are manipulated the grabs operating in the shaft. The second platform is for equipment; the third serves for concreting the wall, while the two uppermost platforms support a funnel through which is poured the concrete. Loading is done by two grabs winched from console-like bedplates mounted on the outlying border of, and underneath, the bottom platform.

The KS-2 installation is a simplified version of the previous model, and is built on only three platforms. Its two grabs are manipulated by winches

Shaft Sinking Records Reported in the Soviet Union

<i>Basin Mine and time</i>	<i>Feet sunk per month</i>	<i>Shaft diameter feet</i>	<i>Performance Inches per man shift</i>	<i>Cubic yards per man shift</i>	<i>Loading units</i>
VETKA-GLUBOVKAYA June 1953	282.45	21.32	1.80	2.3	B C-1-3
CHIAKINA-GLUBOVKAYA September 1953	330.11				
DUVONAYA-ZHUCHNAYA June 1953	336.28	19.68	2.16	2.2	
IGNATIEVSKA September 1953	395.67	21.32	1.86	3.5	B C-1-3
IGNATIEVSKA August 1954	459.63	21.32	1.61	3.3	
BUDYENOVSKI October 1954	427.82	18.04	2.52	1.7	
BUDYENOVSKI-VOSTOCHNAYA September 1954	492.12	19.68	3.07	2.1	B C-1-3
KALININ, No. 5-6 March 1955 (28 days)	663.06	21.32	2.40	2.4	B C-1-3

that are located and operated like those of the KS-1 model.

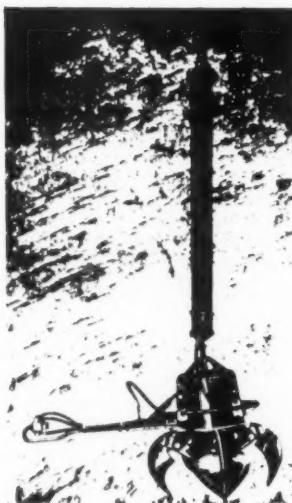
Sink by Drilling

The PD-1m type is less of a loading and hoisting installation, and more of a shaft sinking combine. It consists of a circular cutting tool (auger) mounted under a platform which serves for both suspension as well as a loading

place for the cuttings. Its weight nears 100 metric tons, and the power required is of 737 horsepower.

The UKB-3.6m type serves to sink shafts by means of what looks like a coring method through a hollow column sunk onto the shaft bottom. At its lower end is attached the drilling outfit which cuts one-third of the shaft face while the remaining section is ex-

How Soviet Grab Speeds Sinking of Small Shafts



GRAB LOADER TYPE LCh-335

In these days of spectacular development in the coal mining industry, the deepening of mine shafts is of paramount importance, and the process of loading the winnings is probably the most time-absorbing link in the working cycle.

The still prevalent practice of shoveling the coal by hand into buckets — an operation requiring considerable human effort — is highly uneconomic. It stands to reason that, considering the limited number of men which can be accommodated in the shaft, the progress of loading is extremely slow.

The LCh-335 loader has provided the most economic means of solving the problem of power-loading of the winnings obtained during the sinking and deepening of shafts irrespective of depth — section — rectangular or circular — and the hydro-geological conditions under which the work is proceeding.

The LCh-335 loader consists essentially of a grab, a pneumatic elevator and a steering gear.

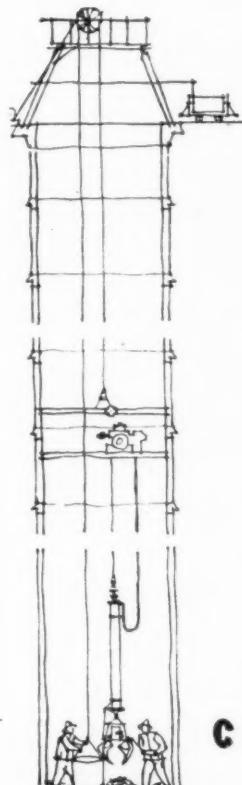
The cylinder and piston are accommodated inside the casing. The reciprocating cylinder causes the shovels to open or close by means of a so-called lever connected with it. The grab casing is suspended on the pneumatic elevator designed to control the grab during the loading operation by means of arms and a universal joint.

The control of the grab arms and of the pneumatic elevator is operated by means of two air valves controlled by two rotary levers fitted to the steering gear. An automatic lubricator, forcing the lubricant to the individual mechanisms under pressure of the air operating the loader, is fitted inside of the loader casing.

The fact that the steering gear is pivoted up the grab casing and that it is suspended on springs simplifies handling the loader in all positions.

A winch type KLCh-15 supplied with the loader is intended for suspending the loader in the mine shaft and for hoisting or, alternatively, for lowering it as the depth of the shaft increases. The initial operation of the loader consists in scooping out a cavity in the winnings so as to accommodate an elevator bucket. The removal of the winnings henceforth proceeds concentrically in the direction of the shaft walls.

The pivoted joint between the grab and the elevator enables the winnings to be collected even on steep or inclined surfaces.



A team of two men, given proper training, is adequate to operate the loader — one to hold with both hands the grips of the control valves on the steering gear, while the other guides the grab to the loading position by means of a hook. One loader is usually sufficient to deal with the winnings in shafts 5 metres in diameter. In shafts of a larger diameter, two loaders which alternate in loading the winnings into a single bucket can be made to operate simultaneously, each loader serving one half of the shaft.

TECHNICAL DETAILS OF THE LOADER

1. Grab capacity	— 0.1 cu m
2. Loader performance	— 8 cu m per hour
3. Time cycle	— 45 seconds
4. Lifting capacity of pneumatic elevator	— 1000 kg
5. Air pressure, minimum and maximum	— 4 and 7 atm
6. Elevator stroke	— 2500 mm
7. Grab cylinder stroke	— 280 mm
8. Diameter of grab, open	— 1300 mm
9. Diameter of grab, closed	— 1000 mm
10. Height of loader, minimum	— 4200 mm
11. Height of loader, maximum	— 8711 mm
12. Weight of loader	— 550 kg

TECHNICAL DETAILS OF THE WINCH

1. Traction force	— 1000 kg
2. Motor power	— 15 HP
3. Motor speed approx	— 2500 r.p.m.
4. Winding drum length	— 375 mm
5. Diameter	— 240 mm
6. Diameter of hoisting rope	— 11 mm
7. Rope speed	— 0.45 m p. sec.
8. Length of winch	— 1885 mm
9. Width of winch	— 1210 mm
10. Height of winch	— 745 mm
11. Weight, including motor	— 1120 kg

SOLE EXPORTERS
CENTROZAP

cavated by peeling layers of rock from wall. No further details are known about the installation at the present time.

The "Uralmashzavod" unit drills shafts of up to 20 feet in diameter in three successive phases: at first a hole 3.9 feet in diameter is drilled subsequently reamed out to 11.8 and, finally, to 20 feet. It is claimed that it was tried out last year, and that its performance was 205 feet of shaft per month.

A Record Shaft

Details of the record Soviet shaft, Kalinin, in the Donbass coal basin have been reported by the technical members of the United Kingdom National Coal Board which visited Russia in 1956.

The vertical lined shaft diameter was 18 feet, rock section was 21.2 feet. Rock penetrated was sandy and clayey shales and sandstones. Only 7 to 10 gallons per minute of water was encountered and easily pumped into sinking buckets.

Nearly all equipment was hung on cables from surface winches, 15 in all. One 25-ton winch was used for double-deck sinking stage, one 15-ton unit for water pipes, two 10-ton winches for compressed air and ventilation lines, seven 5-ton units for girders, three 5-ton units for blasting and lighting cables, and one 5-ton unit for safety ladder.

Loading was done by three 3.53-cubic-foot grabs operating simultaneously with muck loaded alternately into two 70.6-cubic-foot sinking buckets. Thirty hole rounds were drilled to depth of 7.25 feet with 12 machines in one hour and 12 minutes. There is no question but that rock was soft and easy to break as only 143.3 pounds of 62 percent dynamite and 30 holes were required per round. One drilling step which is not normally employed in the Western world because of safety regulations was the start of drilling as soon as solid rock had been cleaned off on the outer rim of the shaft. As mucking proceeded, more drills were added as soon as there was room and rock to drill.

The Russians used 134 men for sinking. Of these 97 were on the surface, 79 in the sinking crew, and 55 for placing permanent lining. (Compare this with the 30-man crew of which only 12 were shaft men at the Farmers Resources Development Corporation's shaft at Carlsbad, New Mexico described by James A. Lilly in the May 1958 issue of MINING WORLD Ed.)

The Russian sinking cycle was planned as follows with actual times in parenthesis: drilling, 35 minutes (40); loading holes and blasting, 22 (20); blowing smoke, 15 (15); mucking, 4 hours 40 minutes (3 and 45); miscellaneous, 56 (60); and idle time, 0 (1).

Steel rings, set 4.9 feet apart, blocked in place, and lagged solidly, were used for temporary lining. Permanent lining was of special bricks, each 15 $\frac{1}{2}$ inches long. These bricks were laid by 12 masons working from the lower deck of the stage. Only 252 feet of this permanent lining using 12,000 bricks was placed during record month.

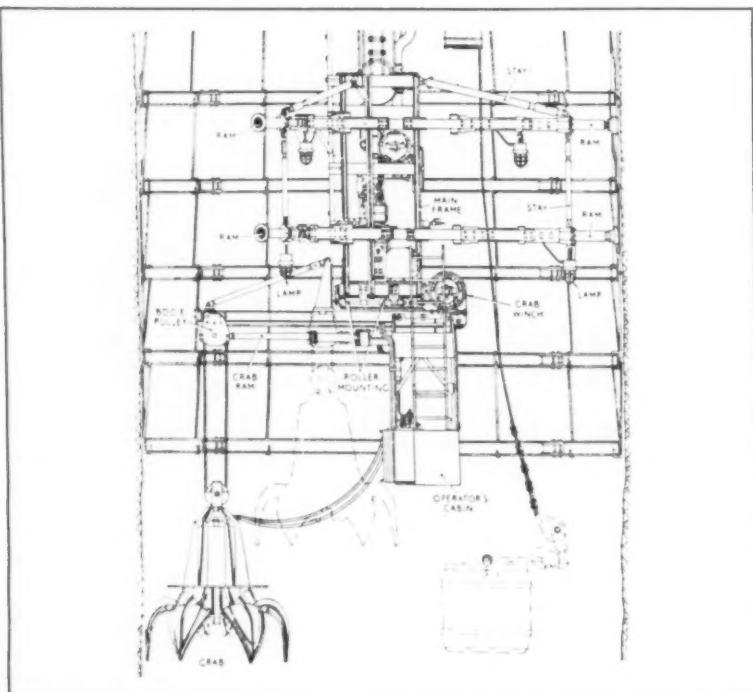
Turbo Drill Sinking

Finally, it may be added—for documentary purposes—the detail that the Soviet Union is currently experimenting with a new shaft sinking system in which loading and hoisting are no longer separate operations but merged into one continuous drilling-slushing process. This new installation consists of three to four turbodrills operating in parallel. At the lower end of the drill string are attached roller bits that revolve around their own axis as well as around the axis of the installation, and perform the cutting. Cuttings are lifted by means of drilling fluid pumped down to the hole bottom.

Further details about this shaft sinking system are not available. Nevertheless, it may be inferred from the scanty information at hand that it works on the same principle on which the drilling turbine (or turbodrill)—developed by Soviet engineers for drilling oil wells—is built and operates. Its novelty consists in the fact that the driving force—which in conventional, rotary drilling system is at the surface—is moved to the bottom of the hole. Power is no longer supplied by the engines at the top of the well but by a hydraulic turbine mounted on the lower end of the drill string, just above the bit. The hydraulic power is generated by the circulating drilling fluid which passes through the turbine, and sets it in motion. The hydraulic motor fulfills the reverse function of a pump.

It is, evidently, too soon to know anything about this system's efficiency and economic results. However, its future practical value in shaft sinking will depend on its performance, i.e., the speed of lifting the crushed rock which alone may cut down the high costs that are undoubtedly involved. In oil well drilling, for example, the economic results of the turbodrill are still a controversial matter among specialists because of the quick wear of the bits. The steel out of which the Soviet bits are manufactured is not hard enough to sustain a high rotational speed in hard rocks. The frequent hole round trips required to replace the worn out bits cancel out most of the savings of materials, at the higher speed and other advantages that this system provides.

THE END



EARLY RUSSIAN SHAFT sinking equipment used one mechanical grab which could be positioned anywhere on shaft bottom. This is the PG unit which is held in place at shaft bottom by hydraulic rams. Picture from U. K. Coal Board Mission.

How Special Paper and Rubber Stamps Will Make Your Mine Drafting Easier

By G. W. IRVIN

Two time-saving and cost-saving methods are used to speed posting of underground geology on geological stope maps at Eagle-Picher Company's San Xavier mine. The initial saving was made by use of larger sheets of paper with printed title blocks and coordinate lines. The second saving was achieved by the use of specially designed and manufactured rubber stamps for coordinate numbers, names and numerical designations of underground workings, and symbols for shafts and raises.

The San Xavier mine is located in the Pima mining district, about 20 miles south and a little west of Tucson, Arizona. The ore bodies, for the most part, are lead and zinc sulphides that have replaced brecciated areas within limestone. Because of the complex geological features, detailed mapping is necessary.

In the past, this was accomplished by making detailed geological maps of each level on 8½-by 11-inch tracing paper. The vertical sections were closely spaced, and there was considerable between-level detail throughout the stoning areas.

By 1951, Eagle-Picher had decided to consolidate the information contained on these many small sheets, and the use of a large size stope sheet was agreed upon. The vertical interval selected conformed to the square set post height used underground. The size of the sheets selected was 3 by 4 feet, because this was the maximum size that would fit in the map cabinets. Since all underground mapping is to a scale of 1 inch equals 30 feet, this allowed a scale distance of 1,000 by 1,400 feet. Over 200 of these large sheets are required to cover the main workings.

The lay out and lettering of each sheet presented an expensive and time consuming project. Past experience had shown the desirability of using Charles Bruning Company's Universal, moisture-repellent, tracing cloth for permanent geological maps. It is moisture resistant, withstands considerable abuse, possesses good dimensional stability, and is not damaged by cockroaches or silverfish. The white grade is used because it shows up

color better than the blue. In 1952 this material listed at \$1.80 per yard or \$2.25 per sheet of the size used. The drafting cost approximated \$12.00 per sheet, which included the layout of the coordinate lines and the necessary lettering. Total price for each sheet was \$14.25, or \$2,850 for the 200 sheets.

It was decided that printing of the sheets might offer savings. The Charles Bruning Company of 855 Cahuenga Blvd., Los Angeles 38, California offered to do 200 sheets at a cost of 28.69¢ each. A model sheet was carefully prepared by the mine draftsman and sent to Bruning which printed the coordinate lines and title block leaving out a few key numbers and letters. The maximum error on the coordinate lines was 1 in 700. The cost of the completed sheets was a little over \$300.00.

Soon after receiving the completed printed sheets, the San Xavier mine closed. In February 1955, McFarland & Hullinger of Tooele, Utah leased the mine and started operations on a smaller scale.

It was still necessary to keep the maps up to date, but without the personnel formerly employed. To eliminate some of the time employed in drafting, a set of rubber stamps was purchased.

Their use has saved much drafting time, and results in neat uniform work. The company plans to obtain more stamps in the near future; these will have engineering and geological symbols that are used frequently.

Thanks to O. A. Rockwell and G. J. Duff of the Eagle-Picher Company, and W. D. Nelson of McFarland & Hullinger for permission to publish this article.

Stamps to Speed Mine Drafting

Stamp Number	Bands	Description	Use	Cost
XCPN1	5	First wide band with mining terms. Second band with dashes only. Three bands with numbers only.	Numbering underground workings	\$7.50

EXAMPLES OF MARKING:

CDH-40 DDH-401 WINZE-4 STOPE-5

DRIFT-6 RAISE-7 SHAFT-8

Special	7	First six bands have numbers only. Seventh band has N., S., E., W. only.	Numbering coordinate lines	\$3.65
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EXAMPLES OF MARKING:

99850E 100860N

Number 2	4	Four bands, each with numbers.	Numbering 0 to 9,999	\$0.95
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EXAMPLES OF MARKING:

99850E 100860N

Number 2½	4	First three bands have numbers only. Fourth band has N., S., E., W., C. only.	Numbering underground workings	\$4.90
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EXAMPLES OF MARKING:

265N 377E 488C 609W 599S

Special	4	Each stamp represents shaft or raise. Drawn three times scale and reduced photographically.	Designate working	\$8.52
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EXAMPLES OF MARKING:



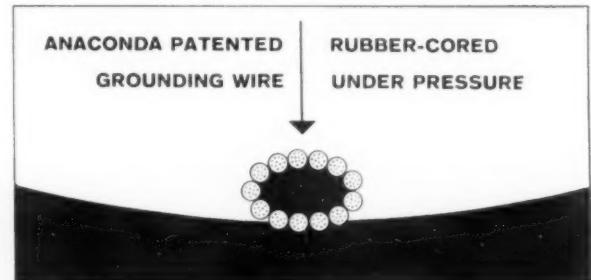
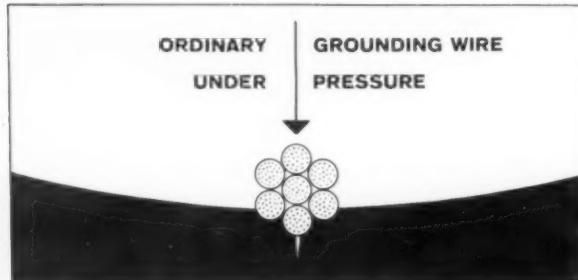
Angel's black indelible marking ink is used on the stamp pad. Errors can be easily removed with a typewriter eraser, if attempted within a few minutes. After the ink sets it is difficult to remove.

Mr. Irvin is general manager of the Sunshine Mining Co., Sauharita, Arizona. He was formerly mine engineer for the San Xavier unit of McFarland & Holinger.



IN-USE SITUATIONS LIKE THE ONE SHOWN HERE prove why Anaconda Shovel Cable with its patented rubber-cored grounding wire outlasts ordinary cable. Under pressure, Anaconda's exclusive rubber core

helps spread out the pressure—prevents internal damage. When ordinary grounding wires are subjected to the same pressure, the solid cores often cut the insulation.



Here's why Rubber-Cored Grounding Wires help Anaconda Shovel Cable last longer!

Abuse in service can seriously shorten the life of shovel cable—unless it has built-in protection, such as you find in Anaconda Shovel Cable. For grounding wire failures are one of the most common troubles. See how Anaconda engineers have solved it:

In the diagrams above you see, at left, ordinary grounding wire: a hard, compact group of stranded ropes. And at right, Anaconda patented rubber-cored grounding wire: flexible groups of stranded ropes around a soft *rubber core*.

When great pressure is applied to ordinary grounding wires, the small, hard grouping of wires bites into the

insulation. Result: cut and damaged insulation. *But* with Anaconda grounding wires:

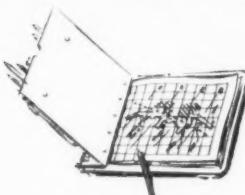
- Anaconda's rubber core acts as a cushion and helps spread out the pressure—resisting damage to the insulation.
- Individual conductor strands are protected, too, to resist the kinks that so often are the cause of fatigue failure.
- Anaconda's grounding wires provide broader contact with the shielding making a more positive ground.

For longer lasting shovel cable, see your Anaconda distributor or the Man from Anaconda. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.



ASK YOUR **ANACONDA®** DISTRIBUTOR
ABOUT **SHOVEL CABLE**

From a Geologist's Notebook



Where To Look For Boron

The carefully guarded tones of Ward Smith of the United States Geological Survey as he spoke before the National Western Mining Conference of the Colorado Mining Association in Denver, Colorado early in February announced discovery of a 40,000,000-ton deposit of boron ore in Southern California. His tone and the carefully chosen statement are in keeping with the quiet program of the United States Geological Survey in cooperation with other Federal agencies, to study the occurrence of boron and aid in the development of larger reserves of this modern miracle metal. We read of the use of boron chemicals for propulsion in the current missile programs, and the possible development by our competitors, the Russians, of boron as a structural metal. Boron is glamorous, but its large volume present uses are confined to such prosaic things as boric acid and soap powders, and there are only three major suppliers of these chemicals. It looks like Kern County Land Company might be a fourth.

If we wanted boron, where would we look for it? Well, boron, with an atomic weight of 11, is stable at the earth's surface in combination with other elements as silicates and borates. It is a rather common constituent of acidic volcanic magmas and their derivatives. Boron is found as borates in fumarolic and hot spring deposits in acidic volcanic areas, but the only commercial source and the largest concentration of borate minerals is the evaporite deposits of California and Nevada.

Boron is found in other parts of the world, in the Tuscany lagoons and fumaroles of Italy, in the Caucasus and Ural mountains in Russia, in the salt deserts of Chile, and the playas of Puno Jujuy and Salda Argentina, in the salines of Nova Scotia and Saxony in Germany, the Cashmere in Tibet, and salt pans of India, but apparently not in quantities as known in the American Southwest.

The Southwest boron province contains Tertiary volcanics and hot springs ranging in age from Oligocene (?) to Recent. It has thick Tertiary accumulations of debris under arid conditions. The United States Geological Survey says that three environments seem to form borate deposits. The least important and still accumulating are the cotton-ball or ulexite ($\text{NaCa}_2\text{O}_6 \cdot 8\text{H}_2\text{O}$) concretions found on the surface in the edges of modern playas, and their fossil equivalents. This may give rise to shoreline stringlike accumulations principally of calcium borates. The deposits of the Furnace Creek formation in Death Valley, California and the Muddy Creek Formation in the Las Vegas, Nevada area are such a type. Another type is the gradual accumulation in saline marshes of a borate mixed with mud. The current borate marshes of Nevada, such as Columbus Marsh, are of such a type. The third is the gradual accumulation from a large drainage area of borates in saline basins where conditions of evaporation are precisely tuned to the precipitation of boron from saturated brines. A modern example of such precipitation is the famous kernite ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$) deposit of the United States Borax and Chemical Corporation at Boron, California.

Such borate salt accumulations may cover several square miles and may be from a few feet to many tens of feet in thickness. The borate content may range from a few percent to 50 percent boron. The minerals present may be calcium borates, such as colemanite, ($\text{Ca}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$), or sodium borates, such as kernite. To form such a deposit, an undrained basin must receive waters from a large drainage area for a long time. The waters must collect boron by percolating through volcanic rocks or boron-bearing hot springs. Desiccation and evaporation must take place. The deposit must then be protected from erosion and dissolution of the borates by cover of non-soluble materials. Can the combination of geologic events which has yielded one major deposit at Boron, and may have formed a second deposit on Kern County Lands, be expected to yield others?

Why not? In the American Southwest at least, there is ample source of boron; there have existed proper geologic conditions in Tertiary time; there are unexplored Tertiary basins; and at the present time, there are a number of people hunting. It is to be expected, then, that some success will be had, but it will not be without considerable expenditure of funds.



"FLYGT PUMPS ARE EASY TO MAINTAIN ... ECONOMICAL TO OPERATE," reports an Arizona Copper Mine

In the inclined shaft of a large Arizona copper mine near Tucson, all mine water drains into a sump at the 700 foot level. Dewatering is a problem because the mine uses a sand-fill type stoping operation, and sand overflow, which seeps into the shaft sump, must be pumped out along with the clear water.

In October 1956, the mine operators replaced a 10 hp, single stage, conventional type centrifugal pump with a 6 hp Flygt Model B-80L Submersible Electric Pump to work against a plus 90-foot head. Under the conditions described, with much of the sand containing abrasive garnet, the centrifugal pump repeatedly was fouling up, casings and impellers were constantly wearing out, and motors needed rewinding an average of once a month due to water intrusion. After over a year's experience with the Flygt Pump, the mine's Mechanical Superintendent reported that Flygt was handling the job easily . . . needed only six impeller replacements in 14 months time, some diffuser plate replacements, and only a few other minor repairs.

On top of excellent performance under tough conditions, the owners stated the Flygt Pump was easy to install with a simple electric hook-up, light in weight for easy handling, and that Flygt eliminated excessive labor in set-up and placement time when service was necessary.

In addition to the Flygt B-80L Pump in the shaft described above, this particular mining company uses a Flygt Model B-38L to pump out the mill sump, containing dirty, gritty washings, and still another Flygt in a second shaft. The Mechanical Superintendent states, "All Flygt Pumps are easy to operate, easy to maintain, and economical to operate."

Flygt centrifugal Pumps range in size from $1\frac{1}{2}$ "-85 GPM capacity to 8"-3,000 GPM capacity. Head capacities range up to 210 feet. Weights range from 80 to 1,200 pounds.

CHECK THESE FLYGT FEATURES

- ✓ Electric
- ✓ Resistant to Salt Water
- ✓ Submersible
- ✓ Easy to Handle
- ✓ Low Maintenance Costs
- ✓ Will pump High Amount of Solids
- ✓ Heavy Duty
- ✓ Continuous Duty
- ✓ Runs Dry Without Damage
- ✓ Quick and Easy to Service
- ✓ No Installation Costs
- ✓ No Priming Needed



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"Not merely to sell; but to serve . . . not only to make good steel products; but to make them still better . . . not only to fulfill today's requirements; but to anticipate tomorrow's—these are the principles that constantly guide CF&I."



C. F. Franz
President

Grinding Mill Bulletin #2

This ad is directed to those grinding mill operators who are interested in increasing the efficiency and production capacity of their ball mills. It is presented by CF&I—in line with our policy "not merely to sell; but to serve"—in the hopes that it will add some new information on grinding procedures.

First Things First—Determine Best One Size Ball Makeup Charge

In the first article of this series, it was shown that determining the optimum size assortment of grinding balls for a makeup charge is a practical means of improving mill operation. Before an attempt is made, however, to work out a ration makeup charge, the best makeup charge of one size ball should be established.

Factors Determining Correct Ball Size Choice

Ball . . . 1) Specific Gravity (affected by voids in the ball); . . . 2) Shape; . . . 3) Homogeneity; . . . 4) Relative Cost of balls by diameter

Mill . . . 1) Inside Diameter; . . . 2) Speed (peripheral speed rather than percent of critical speed)

Manner of Operation (assuming one-stage grinding only) . . . 1) Open or Closed Circuit (percent circulating load of closed circuit); . . . 2) Mill Pulp Density (specific gravity of pulp constituents)

Feed Material . . . 1) Size Structure of Mill Feed; . . . 2) Desired Particle Reduction; . . . 3) Character of Ore, i.e. (a) Specific gravity of gangue and of mineral or minerals, and (b) Grindability characteristics (communition to crystal sizes; comminution through crystal sizes; sliming characteristics)

Ball Makeup Charge of One Size, for a New Mill
Use all the tools at hand to determine the best one size ball makeup charge: laboratory tests of feed material, mathematical formulae, and recommendations from ball mill and grinding ball manufacturers. One's own experience, of course, is invaluable. Full confidence cannot be placed in mathematical formulae for they may not accurately take into account all the factors affecting the not-fully-understood, complex mechanics of ball mill grinding. Tests made with laboratory-size equipment can indicate grindability of ore, but such scale-size work has its limitations in that the ratio between mill diameter, mill peripheral speed, ball diameter and particle size obtained in laboratory is not the ratio that exists in the full-scale operation.

Character of Ore—So IMPORTANT!

When a new mining property is being developed, the ore body is often not accessible; so that sampling will not indicate all the types of ore that will eventually be encountered. It is important that the comminution problem of the various ores to be encountered be studied in terms of the subsequent metallurgical processes, both physical

and chemical. The degree to which the ores will be blended before entering the ball mill should be taken into consideration.

If no blending or poor blending is anticipated, the most difficult grinding ore should be given the most weight in determining ball size, although this size may be too large for the softer ores.

Effect of Ball Size

Either too large or too small a ball size addition will result in decreased mill throughput and increased power consumption per ton of ore ground for ball mill operations in closed circuit. Under-size balls haven't the impact to break the larger particles effectively, adversely affecting subsequent mineral liberation. Over-size grinding ball addition results in the seasoned charge of fewer balls offering less surface for attrition grinding, thus giving too coarse a grind for efficient mineral liberation. The optimum one size ball addition is a "happy medium" between these two conditions.

The penalty for the use of too small a size ball addition is generally considered greater than for using too large a size ball, so the tendency is to favor the larger size.

CF&I grinding balls are available in diameters from $3\frac{1}{4}$ " to 5", and are forged from special analysis steel. They are carefully inspected throughout production and immediately before shipment to make certain they have no surface pits, circumferential ridges or other surface unevenness. They are specified by many leading mill operators. Your nearest CF&I sales representative will be glad to give you complete details.

Indications of wrong size balls used in makeup charge in an operating mill will be discussed in the next article in this series on ball rationing.

For a reprint of the article on which this ad is based, please write on your company letterhead to: Mining Supply Department, The Colorado Fuel and Iron Corporation, P. O. Box 1920, Denver, Colorado.

OTHER CF&I STEEL PRODUCTS FOR THE MINING INDUSTRY

CF&I Grinding Rods • CF&I Grader Blades • CF&I Industrial Screens
CF&I Mine Rail and Accessories • Wickwire Rope • CF&I Rock Bolts



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Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita

United States

Personalities in the News—



CLYDE E. WEED, (left) former president of the Anaconda Company, has been elected chairman of the board and chief executive officer of the Anaconda Company, Chile Copper, Company, Chile Exploration Company, and Andes Copper Mining Company, succeeding the late **ROY H. GLOVER**. **CHARLES M. BRINCKERHOFF**, (right) former executive vice president of Chile Exploration and Andes Copper, was elected president and director of Anaconda and president of the three subsidiaries. **C. JAY PARKINSON**, general counsel of Anaconda, was elected vice president. **NORBERT F. KEOPEL**, former assistant to the vice president of Chile Exploration and Andes Copper, is now vice president of the companies, and **RICHARD S. NEWLIN** has been elected a director of Greene Cananea Copper Company, Chile Copper, Chile Exploration, and Andes Copper.

Stuart V. Bradley was recently appointed to the newly created position of staff assistant to director of mineral development with the Oliver Iron Mining Division of the United States Steel Corporation at Duluth, Minnesota. Mr. Bradley was formerly assistant manager, mining engineering. **Herbert Axelson**, former assistant chief mining engineer, has been named to replace **Norman Moberg** as manager, mining engineering. Mr. Moberg is now director of mineral development for the division.

Dr. Paul D. V. Manning has accepted a position as professor of chemical engineering at the California Institute of Technology, Pasadena, California, effective July 1. Dr. Manning will retire from his position as senior technical vice president of International Minerals & Chemical Corporation, Chicago, Illinois, on June 30.

JOHN D. BRADLEY (right), president of the Bunker Hill Company, San Francisco, California, has been elected president and chairman of the board of the Lead Industries Association. **F. S. MULOCK**, president, United States Smelting, Refining, and Mining Company, Boston, Massachusetts; **FELIX E. WORMSER**, vice president, St. Joseph Lead Company, New York; and **KENNETH W. GREEN**, director of purchases, the Electric Storage Battery Company, Philadelphia, Pennsylvania, were elected vice presidents. **ROBERT L. ZIEGFELD** continues as secretary-treasurer. One new director, **R. D. BRADFORD**, vice president, American Smelting and Refining Company, Federated Metals Division, was elected to fill a vacancy on the board. All other directors were reelected.

Robert F. Winkle, former mine planning engineer with Kennecott Copper Corporation's Ray Mines Division at Ray, Utah, has been promoted to pit maintenance foreman, succeeding **R. L. Williams** who has resigned. **Henry Franz**, former project development engineer in the division's WMD Research Department, has been placed in charge of the sponge iron-acid plant and LPF process at Kennecott's Hayden plant. **Hans Pick**, also associated with the WMD Department, will assist Mr. Franz. **Edward Feldhake** recently transferred from the Nevada Mines Division to the Hayden plant where he will serve as control chemist.

Clyde Rexroad has been promoted to mine maintenance foreman with the Southwest Potash Corporation in Carlsbad, New Mexico. Mr. Rexroad joined the company in 1952 as a production employee. He was transferred into the maintenance section in September 1953 as a maintenance man and held that position until his recent promotion.

L. Daniel Langfeldt, mining engineer, recently assumed duties with the Health and Safety Activity of the Bureau of Mines with headquarters in Duluth, Minnesota. Mr. Langfeldt has had mining experience with the Anaconda Company at Butte, Montana; Homestake Mining Company at Lead, South Dakota; and the United States Smelting and Refining Company at Lark, Utah. He will make his home in Duluth.

Norman Moberg has been appointed director of mineral development for Oliver Iron Mining Division, United States Steel Corporation, Duluth, Minnesota. Mr. Moberg, who has been manager of Oliver's mining engineering department for the past five years, replaces **Lloyd J. Severson** who was recently transferred to the company's operations at Montreal.

Francis L. Pierson has been promoted to chief geologist for United States Potash Company at Carlsbad, New Mexico. Mr. Pierson was formerly senior geologist.

Royal J. Gidney is now director of the Construction and Supply Division of the Grand Junction, Colorado operations office of the United States Atomic Energy Commission. Mr. Gidney previously served at AEC's office in Richland, Washington.

Paul V. Williams has been appointed underground mine foreman with the Ozark Ore Company at Iron Mountain, Missouri. Mr. Williams has been associated with Ozark Ore since 1948.

E. C. Silver is now superintendent of Oliver Iron Mining Division, United States Steel Corporation's Hull-Rust mine in Minnesota. Mr. Silver previously served as assistant superintendent of the Sherman Mine at Chisholm, Minnesota.

Walter Gibson, boilermaker foreman with Inspiration Consolidated Copper Company, and **Harry H. Wolf**, auto mechanic foreman, recently retired after more than 20 years service with the company.

J. D. MACKENZIE (right) is now president of American Smelting & Refining Company, New York, New York. **R. W. VAUGHAN**, former president, has been elected vice chairman of the board. Mr. MacKenzie has served with ASARCO since 1920 and was

elected vice president in charge of all smelting and refining operations in 1948. He is also director of General Cable Corporation, Revere Copper & Brass, Inc., Southern Peru Copper Corporation, and Western Phosphates. Mr. Vaughan joined ASARCO in 1937 as assistant general counsel, served also as vice-president and general counsel, and was elected president in 1957. **R. L. JOURDAN**, former manager of the ore purchasing department, was elected vice president.

G. E. Atwood, resident manager of Duval Sulphur & Potash Company's copper division and former resident manager of the company's potash division at Carlsbad, New Mexico, has been elected a vice president of the company. Mr. Atwood will continue in charge of the copper operations at Tucson, Arizona and will also direct the company's research and development program.

Edward P. Shea has been appointed to the newly created position of chief geologist with the Anaconda Company's Montana Division. Mr. Shea has been associated with Anaconda since 1924.

Howard Lee Young, vice president of the American Zinc, Lead, & Smelting Company, has been elected to the company board of directors, filling a post left vacant by the recent death of **Erle V. Daveler**. Mr. Young has been associated with the company since 1937, when he joined the sales department at Columbus, Ohio.

Marvin Chase has joined the staff of United Western Minerals at Santa Fe, New Mexico. Mr. Chase has been placed in charge of the Colorado exploration project which centers mainly now in Tallahassee Creek-South Park areas of southern Colorado.

S. D. STRAUSS (right), vice president and manager of sales, American Smelting & Refining Company, New York, has been reelected president of the American Zinc Institute. Other officers, also reelected for another year, are: **J. D. BRADLEY**, president, Bunker Hill Company, San Francisco, California, as vice president; **CLARENCE GLASS**, Anaconda Sales Company, New York, vice president; **H. L. YOUNG**, American Zinc Sales Company, St. Louis, Missouri, vice president; **G. H. LEFEVRE**, United States Smelting, Refining, & Mining Company, New York, executive vice president; and **J. L. KIMBERLY** of New York as secretary.





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breakage and dispersal of rock in order to provide required channel depth without dredging.

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Newsmakers in International Mining

WILLIAM F. SPAIN has been appointed general manager and director of Wah Chang (Australia) Pty. Ltd., Melbourne, Australia. Wah Chang (Australia) is a joint venture company controlled equally by the Wah Chang Corporation, New York, New York, and King Island Scheelite, King Island, Australia. Activities in the past have been limited to metals export, but a more diversified program is expected following new management arrangements.



James B. Scott, former resident geologist with the Santa Barbara unit of Cia. Minera Asarco, S. A. at Santa Barbara, Chihuahua, Mexico, has returned to the United States and is now living in Oakland, California.

Dr. J. W. N. Sharpe, managing director of Rio Tinto Mineral Search of Africa (Pty) Ltd., recently transferred from Johannesburg, Union of South Africa to Salisbury, Southern Rhodesia, where the company's head office is now located.

Sverre A. Wee, Peruvian mining engineer, has moved from Lima to Talara, Peru where he is associated with Hammarberg & Koehler Talara S. A.

Charles Forgan, consulting mining engineer, and G. N. Healey, consulting mechanical and electrical engineer, of Selection Trust Ltd., London, England, have been touring group mines in Northern and Southern Rhodesia.

James A. Pike, president of the British Columbia Mining Association, was recently installed as a vice president of the Canadian Institute of Mining and Metallurgy. Mr. Pike will represent British Columbia and the Yukon. Other newly elected vice presidents are Fred Gover, Newfoundland and Maritimes; Karl Lindell, Quebec and Labrador; Kenneth C. Gray, Ontario east; G. Neely Moore, Manitoba, Saskatchewan and Ontario west; and R. A. Hemstock, Alberta and Northwest Territories.

G. B. O'Malley, director and head of the technical services division of Cyanamid Australia Pty., Ltd., has been awarded the Australasian Institute of Mining and Metallurgy Medal. The medal is given annually for outstanding service in the mining and metallurgical professions.



PAUL KLEMPNER has been appointed progress engineer at the London, England headquarters of the National Coal Board. Mr. Klempner will be engaged with projects planned to bring the production of Great Britain's 700 coal mines to 240,000,000 tons per year by 1956, at an estimated expenditure of nearly £1,000,000,000.

Henry A. Brimo has been reelected president of Baguio Gold Mining Company, The Philippines. Edmund A. Schwesinger was reelected vice president; Bienvenido A. Tan, Jr., second vice president; and Ildefonso O. Elegado, secretary-treasurer. Vincente Sayson and Teodoro Padilla were elected as new members of the board of directors.

Arthur H. Miles recently retired from active service and left Penang, Malaya after nearly 54 years of employment there as a tin miner and company director. Mr. Miles first worked as an engineer on the first tin dredge in the Malay peninsula, for the Tongkah Harbour Tin Dredging Company. Later he was associated with Henry Waugh in forming several tin dredging companies in Malaya. Mr. Miles plans to make his home in Southern Rhodesia.

Myung Sik Ro, director and plant manager of the Changhang Smelter and Refinery in Chungchungnamdo, Korea, and Taek Chin Kim, chief of the company's smelting section, recently visited mining and smelting operations in Australia. Before returning to Korea, Mr. Ro and Mr. Kim plan to visit London, England, Stockholm, Sweden, Helsinki, Finland, and Hamburg, Germany to inspect other smelting operations. The Changhang Smelter and Refinery, the only non-ferrous smelter in South Korea, is being rehabilitated by the United Nations at the present time.

Javier Lagarrigue, a representative of the Chilean government to international copper discussions, arrived in the United States recently to learn the viewpoints of government experts and private industry on the copper market. Before returning to Chile, Mr. Lagarrigue plans similar visits to London, England and Paris, France.

Onesime Gagnon, Lieutenant-Governor of the Province of Quebec, Canada, and N. E. Phipps of Toronto, Canada, have been elected to the board of directors of La Compagnie Miniere de l'Ungava Limitee. The company, commonly known as Cominga, is engaged in the development of nickel-copper concessions in northern Ungava in the Province of Quebec.

Russell Gibson, former associate professor of economic geology at Harvard University, Cambridge, Massachusetts, has accepted a year's assignment with the United Nations Technical Assistance Administration in Pakistan. Mr. Gibson will undertake a preliminary survey of the country's radioactive resources, and will advise Pakistan's Atomic Energy Commission on a comprehensive program for an atomic raw materials ground survey in both East and West Pakistan.

Walter J. Williams was recently elected president and director of the Newfoundland and Labrador Corporation, St. John's, Newfoundland. Mr. Williams was formerly employed with Erie Mining Company in Minnesota and more recently has been associated with Pickands Mather & Co.'s eastern Canadian iron ore interests.

DUDLEY L. DAVIS is now managing director of Kumhila Exploration Ltd. at Vancouver, British Columbia, Canada, and will be in charge of the company's dredging operations at Wells, British Columbia during the summer. Mr. Wells is also general manager of Bay Shore Mining Company, Inc., with permanent headquarters at Salt Lake City, Utah.



Tom T. Heywood, mining engineer formerly associated with the Bukit Besi iron mine at Dungun, Trengganu, Malaya, has returned to England and is now residing in Lancashire.

Glen Morgan, general manager and treasurer of Edgecumbe Exploration Company, has returned to the company's office at Sitka, Alaska after attending a board of directors' meeting in California. Edgecumbe is doing assessment work on its Ecco claims at Silverbay, Alaska.

Pascual Amogan and Pastor Velasco were selected as recipients of mining scholarships awarded by Benguet Consolidated, Inc., Baguio, The Philippines. The scholarships are given to sons of active company employees. The boys' fathers are Simeon Amogan, an Acupan mine foreman, and Mr. Velasco, a mill mechanic.

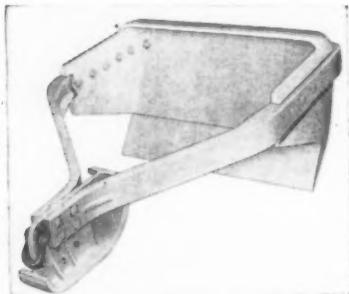
R. Massey Williams has resigned as chief consultant on mining engineering and geology for Continental Mining Exploration Ltd., Toronto, Canada, and has returned to private practice as a consultant. Mr. Williams' new office is at Suite 408, 100 Adelaide Street West, Toronto 1, Ontario. Prior to joining Continental Mining in 1953, Mr. Williams was employed as general manager of Miami Copper Corporation's Canadian subsidiary.

H. T. Andrews, a former South African ambassador, recently retired from the diplomatic service and has been appointed a director of Consolidated Diamond Mines of South West Africa and of Welkom Gold Mining Company Ltd. Other recent mining appointments in the South Africa area include N. W. S. Lewin as a director of Blyvooruitzicht Gold Mining Company, Ltd. and J. G. N. Strauss as a director of the South African Land and Exploration Company, Ltd.

WILLIAM D. LORD, JR., mining engineer of Prescott, Arizona, has accepted a position with Cia. Minera de San Jose at Sonora, Mexico. Mr. Lord served as manager of mines with the International Mining Company of Bolivia for six years, returned to the United States in 1954, and has been employed with various United States mining companies for the past four years.



PRODUCTION EQUIPMENT PREVIEW

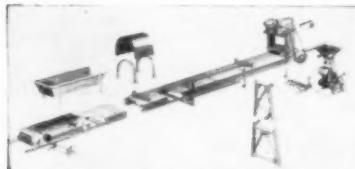


"Superior" Scraper Line By Thompson-Berg

The all-new heavy-duty, hardened alloy steel "Superior" Slushing Scrapers for mining incorporate proven design features which greatly increase digging capacity and load carrying ability. Designed and built by the Thompson-Berg Company, Iron Mountain, Michigan, the new line of "Superior" Scrapers are offered in sizes ranging from 36 inches through 84 inches for use with slushers from 10 to 150 hp. For additional information write direct to company.

Slusher Facts Available From Vulcan-Denver

A 16 page brochure, "Catalog DB-5709," gives complete specifications on all lines of Vulcan-Denver slushers including new developments in integral automatic controls and remote control systems. Copies are available on request from The Vulcan Iron Works Company, 2960 South Fox Street, Denver, Colorado. Slushers include single, double, and triple drum models in both single shaft and tandem styles. Sizes are from 10 to 150 horsepower.



A New Pre-Engineered Sectional Belt Conveyor

A new pre-engineered sectional belt conveyor, featuring bent-plate decking and conveyor components has been introduced by Stephens-Adamson Manufacturing Co., Ridgeway Ave., Aurora, Illinois.

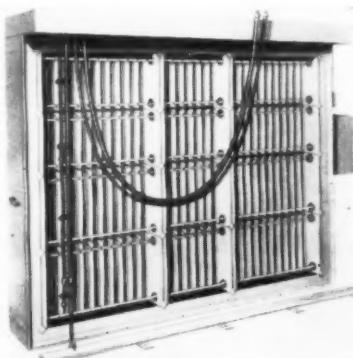
The new packaged unit complete with head and tail assemblies, supporting "A" frames, and intermediate sections of bent-

plate decking provides low initial cost and maximum flexibility. The conveyor is available in 18, 20, 24, 30 and 36 inch belt widths, with drives ranging up to 50 hp. For additional information write directly to the company.



New Picking and Sorting Conveyor by Hack Eng.

Here is a new conveyor which is a slow moving belt table which allows accurate hand sorting of all types of ore. This is a package conveyor unit, which can be easily assembled and put into immediate operation. The unit has a variable speed control, and workers are protected by rolled steel guards along the sides of the conveyor. For additional information write to Hack Engineering Co., 124 Wazee Market, Denver 4, Colorado.



High-Velocity Electronic Precipitator Introduced

A new high velocity electronic dust precipitator has been introduced by the American Air Filter Co., Inc. The Electro-cell unit is now offered in a new design which operates at face velocities of up to 600 feet per minute. High efficiency is maintained while overall compactness has been greatly improved. The actual size reduction 30% in face area and 50% in cubic requirement over conventional pre-

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

cipitators. Sectional construction for ease of assembly is featured and each cell has its own set of vertical ionizing wires. For additional information write to company at 215 Central Ave., Louisville 8, Kentucky.



Trilok Fabric Supports And Drains Filter Media

The National Filter Media Corp., distributors of United States Rubber Company's Trilok fabrics for filter process applications, reports increasing acceptance of this new material by filter users.

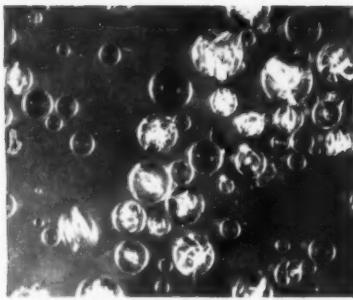
Applications are primarily for use as a filter media support and drainage member for wet process filters. The smooth surface, as compared to conventional coarse woven wire or perforated plate, increases filter media life and eliminates the need for undercovers, even with the lightest media. The honeycomb structure gives unexcelled hydraulic flow of filtered liquids. For additional information write to company at 1717 Dixwell Ave., New Haven 14, Connecticut.

Ingersoll-Rand Develops A New Dustless Stopper

Ingersoll-Rand, 11 Broadway, New York 4, N.Y., has developed a new rock drill known as the "Vacujet" dustless stopper which sucks all dust and cuttings down through the drill, then discharges them under pressure through a long hose to a container.

Vacuum is developed by an ejector jet incorporated into the back head of the drill. This vacuum draws the cuttings down through the drill steel and the drill. When the dust and cuttings reach the jet, they are caught in the jet air stream and pushed under pressure through a hose to a tank or bag 25 feet or more away from the drill.

Awkward dust-hoods and cumbersome vacuum lines are eliminated by the through-the-drill type of discharge. The line used for carrying away the dust and cuttings is ordinary one-inch air hose and not costly vacuum-type hose. For additional information and brochure, write to the company. Use handy reader service card.



Dow Announces New White Cation Exchange Resin

A new white cation exchange resin with increased strength and stability has been developed by The Dow Chemical Company. The first white high capacity resin to be marketed commercially, the new material has been named Dowex 50W.

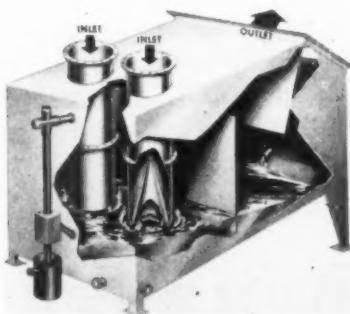
In addition to color, its advantages are greater physical stability with less internal stress, decreased heavy metal content and greater bead strength. In industrial applications where attrition losses have been a significant factor, Dow reports that tests have shown a reduction of such losses by as much as two-thirds, due to the greater physical strength of the bead. For additional information on this new resin, write to the company at Midland, Michigan. Use handy reader service card.

Lightweight Diamond Drill Carried by One Man

The new lightweight Monarch diamond core drill is light enough to be carried by one man, or can even fit into a light aircraft. And, according to the manufacturer, it can drill in almost any formation to depths of 100 feet or more.

A small rotating type pump using a stainless steel rotor is included with the outfit. The pump develops 100 pounds pressure and will pump up to 500 feet from the source.

The entire unit weighs about 70 pounds and recovers a $\frac{3}{4}$ -inch core. For additional information write: Monarch Equipment Co., Box 3006, North Hollywood, California.



New Dust Collector Is Highly Efficient

A major addition in the field of wet scrubbers for dust collection, the Turbulaire-Doyle Scrubber, is now being of-

fered to industry by Western Precipitation Corporation under a license agreement from the original developer, The Consolidated Mining and Smelting Company of Canada Ltd. (Cominco). Perfected by Harold Doyle of Cominco and backed by many years of application in Cominco's own diversified plant operations, the Turbulaire-Doyle Scrubber impinges dust-laden gas at high velocity into a pool of scrubbing liquid. The high velocity impingement causes the gas and dust particles to penetrate deeply into the liquid bath, accentuating the wetting action to produce high dust collection efficiencies, even on particles in the fume range. A wide range of plant gas cleaning and cooling applications have shown results at a relatively low power consumption, low liquid-to-gas and low liquid-to-dust ratios. For additional information write to Western Precipitation Corp., 1000 West Ninth St., Los Angeles 54, California.



Le Roi Compressor With Speed of Only 1,000 RPM

A new 365 rotary air compressor with an air compressor speed of only 1100 rpm has been announced by the Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

The Le Roi 365RD2 is the second of a new line of rotary air compressors. It is a portable, two-stage, oil-cooled, sliding vane type compressor rated at 365 cfm of free air compressed to 100 psi.

The compressor is coupled to a GM 471 Diesel engine with a hydraulically actuated clutch. Engine speed at rated output of compressor is 1650 rpm. A 100% capacity control matches air supply to the air demand within a pressure range of 10 psi. For further information write direct to the company.

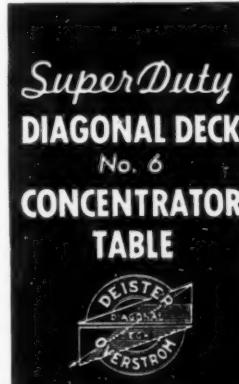
Notes From The Manufacturers



R. G. LeTourneau, Inc. has re-entered the earthmoving equipment business after an absence of five years. In 1953 LeTourneau's earthmoving business was sold to Westinghouse Air Brake Company with the stipulation that the original company would remain out of the field for a five-year period. Although production will not begin for several months, business activities were resumed on May 1. No announcement has been made of the machines to be manufactured but it is believed LeTourneau's "electric wheel" power system will be incorporated in earthmoving machines. Shown above is R. G. LETOURNEAU, president, standing beside an "electric wheel" machine used by the Air Force to remove crashed bombers from runways.

Sloan & Associates, Inc., 51 Foothill Boulevard, Arcadia, California, is a newly established aerial survey consulting firm, headed by Ivan I. Sloan, who was formerly vice president of Hycon Aerial Surveys, Inc. Sloan & Associates will be equipped for all phases of aerial survey work, and will feature complete plant, instrument, and aircraft facilities.

Hewitt-Robins Incorporated will erect a new 60,000-square-foot manufacturing plant for the production of industrial wire cloth and wire mesh conveyors at King-of-Prussia, Pennsylvania. The news was announced by H. E. Kleintop, manager of the company's subsidiary, Korb-Pettit Wire Fabrics and Iron Works, Inc.



SuperDuty DIAGONAL DECK No. 6 CONCENTRATOR TABLE

For Highest Efficiency in Mineral Concentration

The concentration of minerals is at its best on the SuperDuty[®] DIAGONAL-DECK[®] table. Its high efficiency is possible because all tabling factors — including shape of the deck, head motion and underconstruction — are carefully coordinated for smooth, effective action. You get maximum recovery, highest grade concentrates and minimum loss to the tailings. Send for Bulletin 118-B.

The Deister Concentrator Co., Inc.

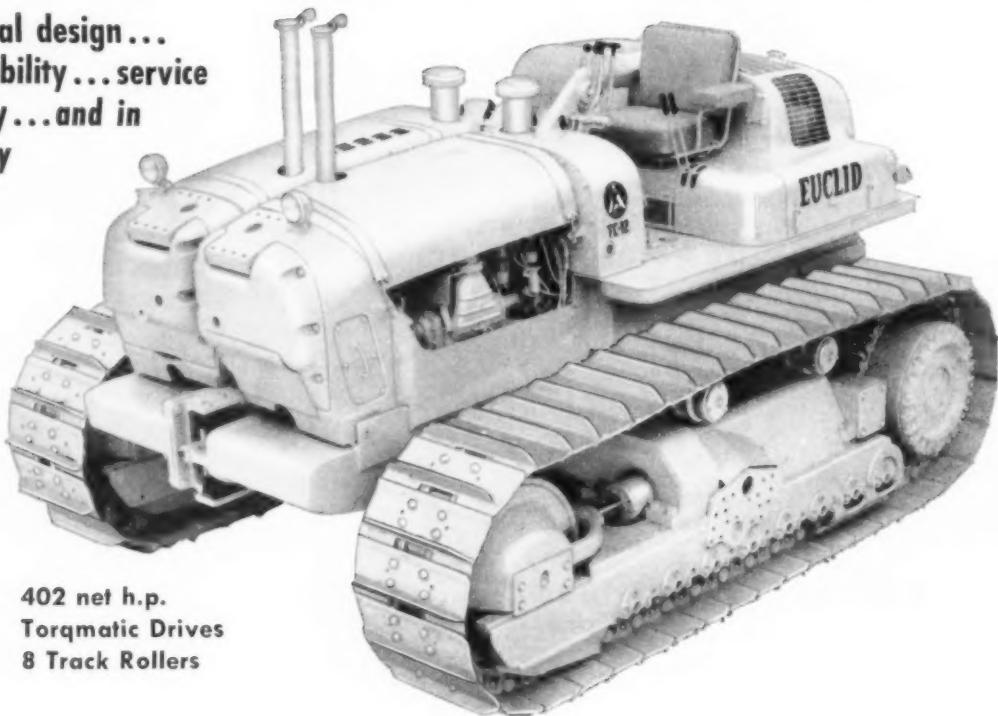
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New Series *Euclid TC-12* . . .

now even further ahead of other crawlers

in functional design . . .
maneuverability . . . service
accessibility . . . and in
work-ability



Ever since the TC-12 was introduced, there has been no question about its top performance ability—even on the toughest crawler jobs. Now with over 3 years of field experience on practically every kind of operation, major product improvements make the new TC-12 better than ever.

Powered by two engines, there's a total of 402 net horsepower delivered to the power train through separate Torqmatic Drives for each track. Big 27" shoes and 8 rollers give the TC-12 good balance with or without heavy duty dozer blades and other mounted equipment. Bare weight of the tractor has been increased to

67,000 lbs. as a result of heavier construction and more rugged components throughout.

With independent track drives, there's no dead track drag when turning—maneuverability of the big TC-12 with its full power shift saves seconds on every cycle whether push loading scrapers, dozing or pulling big equipment. With unitized assembly, good design of component location and equipment mountings, this "Euc" provides easy accessibility for service and maintenance.

Have your Euclid dealer give you all the facts on the new TC-12 . . . you'll find its your best buy by far where big tractor performance is needed.

EUCLID DIVISION OF GENERAL MOTORS, CLEVELAND 17, OHIO



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Hydraulic Stope Filling Discussed by Mining Experts at Informative Montana Symposium

Hydraulic stope fill was the subject of a 2-day symposium held at the Montana School of Mines, Butte, Montana, on May 9 and 10. A program of 11 well-qualified speakers probed the problems and advantages associated with the preparation of and emplacement of mill tailing underground. Audience participation in discussion of speakers' topics contributed still further valuable data. Experienced observers were of the opinion that the meeting was one of the most informative of its kind ever sponsored.

Most of the discussion centered on attainment of practical percolation rates for adequate stope drainage and fill-setting characteristics and on factors involved in pipeline transportation of slurries.

One need only refer to the remarks of John M. Suttie, mine superintendent of the Anaconda Company's Mt. Con mine, to realize some of the tremendous inherent advantages in utilization of hydraulic fill. Stopes were formerly timbered with square sets at the Mt. Con. Now 90 percent of mining is done by cut and fill using rock bolts for temporary support. Adoption of hydraulic fill at the Mt. Con reduced by 36 percent the number of active stope required for production; resulted in a 54 percent increase in tons per man shift; and reduced labor cost 12 percent.

Transportation of slurries in pipelines was discussed by Fred L. Smith, manager, mining division, Colorado School of Mines Research Foundation. The Montana School of Mines has undertaken a pilot plant study of the transportation of hydraulic backfill slurries. Results of recent tests were described by George L. Wilhelm. Both of the above sources are developing data regarding the effect of viscosity of the pulp, friction losses in pipelines, and relationships of pulp density to critical velocity required for pipeline transportation.

Preparation of mine backfill using wet cyclones was the subject of an article by R. T. Dottery, Dorr-Oliver Inc. He described cyclones as one of the most economic and efficient methods of de-slimer tailing for use as backfill. An acceptable percolation rate for a backfill of good characteristics is 4 to 6 inches per hour, based on a test using an 80-millimeter-diameter glass tube 4 feet long which is open at both ends, filled with solids, and water poured on top. It was brought out by personnel of the Anaconda Company that the percolation rate of a hydraulic backfill product may change by the time it is delivered underground. For instance, a classified backfill showed an 8-inch percolation rate before delivery underground. By the time the fill had been transferred 4,000 feet underground to the stope, the percolation rate had been reduced to 2.5 to 3 inches per hour. Interparticle abrasion during transportation was advanced as a possible cause for the reduced rate of percolation.

A sloping discharge line of 30 to 70° above horizontal is one of the most difficult jobs for materials handling work, said Mr. W. B. Stephenson, president, Allen-Sherman-Hoff Pump Company. The tendency is for the coarse solids to roll out and impinge on the bottoms of the pipeline and possibly settle down slope with a resulting higher density of pulp at the bottom of the sloping line.

Sand filling at Chibuluma mine, Northern Rhodesia, costs about 3.79 shillings (shilling is approximately \$0.14) per ton of ore hoisted. This amounts to about 9.72 shillings per dry ton of fill placed. These figures were brought out in a paper, written by J. P. Norrie, consulting engineer, and H. L. Henry, formerly underground manager, Chibuluma Mines, Ltd. At this mine it was decided that 10 percent minus-325-mesh was the maximum slime content which could be tolerated in the backfill product. A spokesman from the Beaverlodge area in Canada commented that a minus-325-mesh, plus-10-micron product in the backfill was acceptable at Beaverlodge. They had found that it was only the minus-10-micron size range which yielded poor percolation rates when included in hydraulic fill.

Sand filling at Homestake Mining Company's operation in Lead, South Dakota, cost \$0.45 per ton of ore mined in 1954; \$0.40 in 1955; \$0.35 per ton in 1956 (when no new pipe was added); and \$0.41 in 1957. Vertical rubber-lined pipe wore out faster in two-thirds of the pipeline; the bottom third of the vertical pipelines required less frequent replacement. These facts were included in a paper delivered by C. N. Kravig, mine superintendent, Homestake Mining Company, Lead, South Dakota.

At Falconbridge Nickel Mines, H. F. Beattie reported that hydraulic backfill was conducted underground through 2½-, 3-, and 4-inch bore holes.

Flocculants may prove effective for preparation of hydraulic stope fill. Research work under a U. S. Bureau of Mines Fellowship, said Donald L. Cenis, indicated that use of certain flocculants would allow the retention of fines in the stope fill, reduce the amount of solids on the sill, reduce the slime layer at the top of the emplaced fill, and still allow a high percolation rate.

The symposium was very well organized and will represent an outstanding contribution to the technical data available on hydraulic backfill. The meeting was sponsored through the cooperation of the Montana School of Mines, the Anaconda Company, the Montana Section of the American Institute of Mining, Metallurgical, and Petroleum Engineers, the Montana Society of Engineers, alumni of the Montana School of Mines, and the Mining Association of Montana.



The first round since an easterly heading on the Yankee Girl vein was halted 10 years ago broke into good-grade silver-copper ore at the Shoshone County, Idaho, property of *Metropolitan Mines Corporation*. A slip had offset the vein only a few feet. The discovery is from the 3,700-foot level of the adjoining *Sunshine* mine. *Sunshine Mining Company* has an 84 percent interest in the Yankee Girl vein by reason of extra-lateral rights.

At the Shoshone County property of *Lucky Friday Silver-Lead Mines Com-*

pany east of Mullan, Idaho, the new 2,600-foot level has been opened for about 200 feet in ore as rich as on levels immediately above. At last report, cross-cutting from the shaft was under way to open a 3,050-foot level, deepest in the mine, and 170 tons of ore were being mined daily from the 2300, 2000 and 1800 levels. Recent development work on the 2450 level raised ore reserves to a 19-year supply at the current annual production rate of 40,000 tons. Dave Elder is mine superintendent.

At the *Senator Stewart* property of *Silver Bowl, Inc.*, Shoshone County, Idaho, crews from the adjoining *Bunker Hill* mine have driven more than 600 feet of a planned 1,800-foot lateral which will serve as a base for extensive diamond drilling.

A good block of silver-copper ore has been opened beneath the "94" stope on the 3100 level of the *Sunshine Consolidated* mine, Shoshone County, Idaho, with reserves estimated at more than 67,000 tons. Surface exploration has disclosed four strong vein structures in addition to the Yankee Girl vein on which all deep development work has been done. W. M. Yeaman, Yakima, Wash., is president, and Norman M. Smith is general manager of *Sunshine Consolidated Inc.*

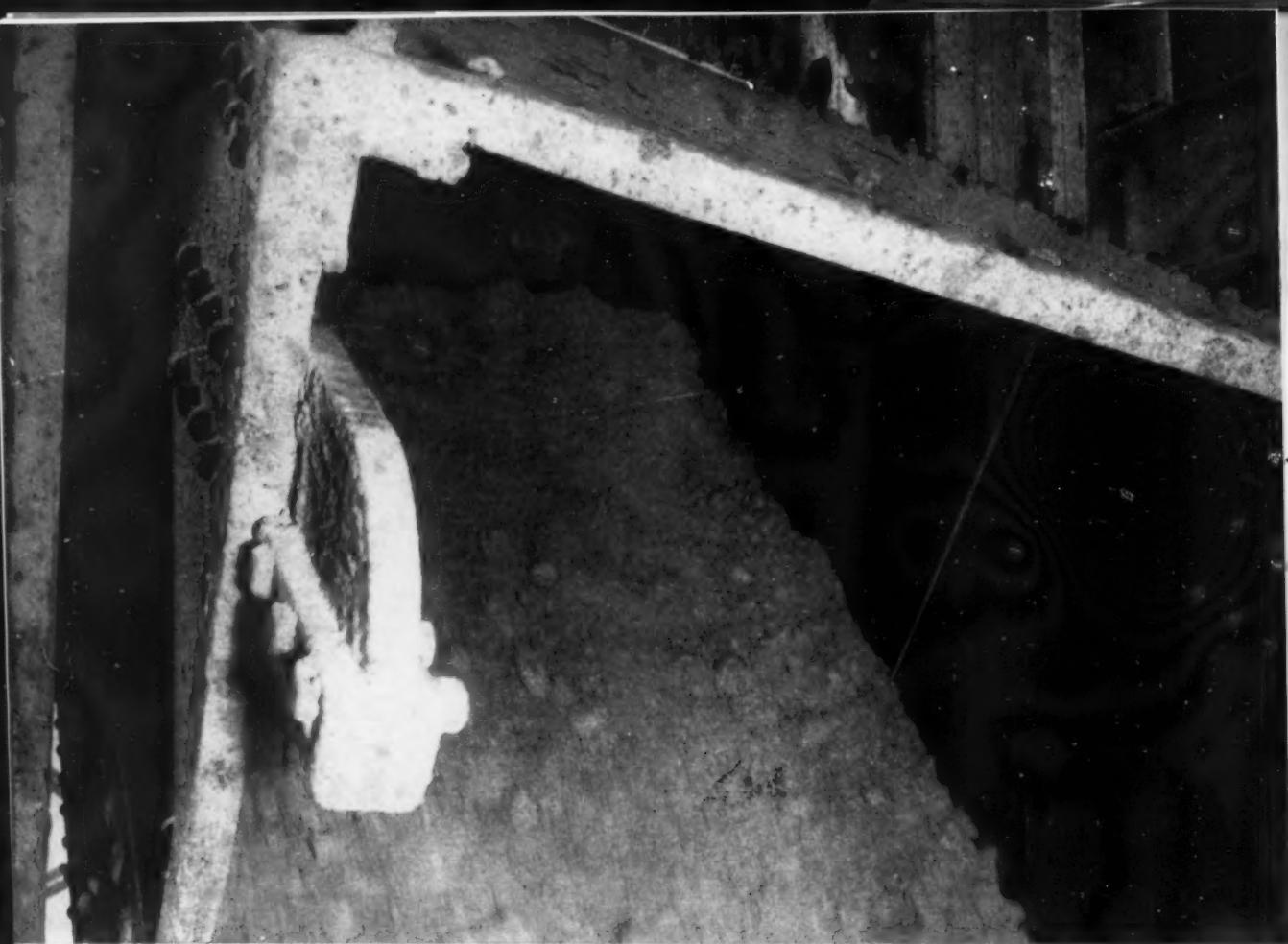
Polaris Mining Company is producing between 700 and 800 tons of silver-copper ore monthly from a north-south striking vein at a depth of 3,000 feet in the *Rainbow* area of the Silver Belt west of Wallace, Shoshone County, Idaho. It also is exploring a 100-foot-wide mineralized zone found farther east. Three diamond drill intercepts showed high values. The *Rainbow* property is controlled by *Cocur d'Alenc Mines Corporation*, headed by Dr. H. C. Mowery of Wallace.

Operations at the *Big Creek* property of *Silver Syndicate, Inc.*, in Shoshone County, Idaho, are concentrated on development of the new 4,000-foot level for production. Raises are being driven to the 3850 level by the operating firm, *Sunshine Mining Company*. W. M. Yeaman of Yakima, Washington, is president of *Silver Syndicate*.

Shipments of alumina-bearing clay from near Deary, Latah County, Idaho to a pilot plant at Anaconda, Montana were resumed by the *Anaconda Company* following a winter shutdown. About 200 carloads had been shipped before the suspension and some 200 additional carloads were to be shipped. *Commercial Builders, Inc.* of Moscow, Idaho is mining the clay. Anaconda has options to purchase more than \$1,000,000 worth of clay lands if its alumina-from-clay process proves economical.

Shaft sinking costs at the *Clayton Silver Mines Inc.* operation in Custer County's Bayhorse district have been running between \$210 and \$212 per foot. Deepening of the shaft from the 550-foot level to the 850 is scheduled for completion by July 1. Crosscut and raise work then is expected to develop nearly 300,000 tons of new ore reserves. Shipments in the last 25 years have been equivalent to 625 carloads of pure metal. Values are in lead, zinc and silver. Norman Smith of Kellogg, Idaho is general manager.

Among the new firms recently incorporated in Idaho are the following: *Copper Nob Mining Company Inc.* of Boivill, by John Sanderson, Byers Sanderson, Sr., and Byers Sanderson, Jr., all of Boise;



Skip bucket liners of USS "T-1" Steel cut dead weight, last longer, cost less to replace than the liners previously used.



"T-1" Steel doubles the life of skip bucket liners

—reduces weight by $\frac{1}{2}$ ton



Skip hoist at Miami Copper Company Mine, Miami, Arizona, hauls abrasive copper ore up a 1080-foot shaft, making 80 trips per hour.

This skip hoist at the Miami Copper Company Mine, Miami, Arizona, has two skip buckets which weighed 19,350 pounds each. The old liners, made of structural carbon steel, consisted of 1-inch-thick bars riveted to $\frac{3}{8}$ -inch-thick plates. By replacing this arrangement with $\frac{1}{2}$ -inch-thick plates of USS "T-1" Steel, weight was reduced by almost half a ton.

The present USS "T-1" Steel front dumping-lip liner and the side liners last more than twice as long as the previous liners. What's more, fabrication costs for a complete lining have been reduced by more than 90%, and replacement time cut to a fraction.

USS and "T-1" are registered trademarks

What USS "T-1" Steel can do for you. This versatile steel has a combination of properties unexcelled for mining equipment. It has nearly 3 times the yield strength of structural carbon steel, outstanding resistance to impact abrasion, exceptional toughness, even at temperatures as low as $-50^{\circ}\text{F}.$, and is readily weldable without preheating.

This means you can get rid of dead weight and lower your costs by using USS "T-1" Steel for dippers, sticks, booms, chutes, hoppers, cars, and other equipment. Write for our booklet, "Mining's Metal, USS 'T-1' Steel." United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



United States Steel Corporation - Pittsburgh
Columbia-Geneva Steel - San Francisco
Tennessee Coal & Iron - Fairfield, Alabama
United States Steel Supply - Steel Service Centers
United States Steel Export Company

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Golden Copper Queen Mining Corporation of Pocatello, by Harold T. Allen and Nathan Seasmuns, both of Logan, Utah, Karl M. Pratt of Salt Lake City, and Clayton S. Hale and James R. Allen, both of Pocatello; *Silver Sun Mines Inc.* of Hailey, by Howard E. Johnson, and Fred Winkler, both of Spokane, and William H. Bakes, Twin Falls.

According to G. Elmo Shoup of Salmon, Idaho, interest is high in the thorium-rare earth and columbium properties in the Agency Creek area of McDevitt district, Lemhi County, Idaho, and the Mineral Hill district of Lemhi County. Operations this summer will include developing, milling, and processing of thorium, rare earth, and columbium ores, containing minor values of titanium, zirconium, molybdenum, copper, gold, and silver, he says. He also reports that a mill is being erected on the *Salmon River Uranium and Thorium Corporation* property.

The *Lone Pine Mining Company*, a new Idaho firm, has started work at the old Lone Pine gold-silver mine and 50-ton mill at Golden, Idaho, idle since World War II. The property was purchased from P. J. Miller of Lewiston. It also includes 29 unpatented claims in the Elk City mining district. The mill is being reactivated and the firm hopes to have it in operation by June 1. President of the company is Donald Rowe of New Meadows; A. G. Darland of Nampa is vice president, and Robert L. Amshay of Kamish is secretary-treasurer.

MONTANA

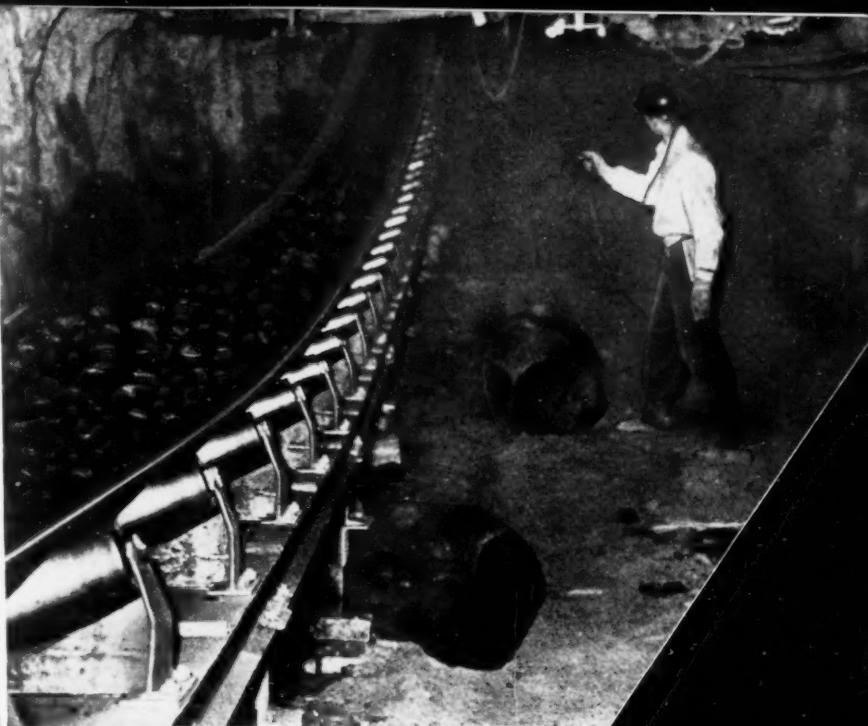
The *Anaconda Company* has reopened the Mt. Con mine in the Butte, Montana district for copper production. This is one of the deepest mines in the Butte Hill, and has been a steady producer of high-grade copper ore for many years.

Midland Mining Company of Billings, Montana is reported to have encountered a good showing of uranium ore at its *Sandra* mine in the Pryor Mountain district. The discovery was made in underground drifting operations.

The *Niki Mining Company* is said to be developing a molybdenite showing on the east side of the Continental Divide, located east of the city of Butte, Montana. The exploration work consists of drifting on a quartz vein containing molybdenite. The company is also constructing a 100-ton-per-day mill on the property.

Extensive bulldozer exploration of barite outcroppings on a five-claim property six miles south of Troy, Lincoln County, Montana, is planned by Donald Kotschevar, Sandpoint, Idaho, mining engineer, and L. H. Kotschevar of Missoula. They purchased the claims from James B. Robinson, Spokane, Washington.

Starting with the first of this year, *Anaconda Aluminum Company* restored a portion of its plant production capacity. The plant had been on full schedule from January 1, 1957 through June 1, 1957, and then was curtailed 12½ percent because of a surplus of finished metal in inventory. On July 1, another 12½ percent curtailment was made. Production

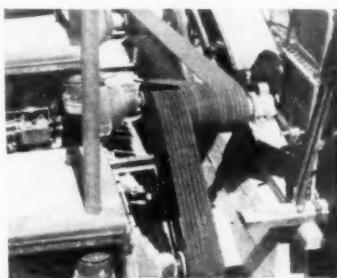


Thermoid Belting *is built to take it... underground!*

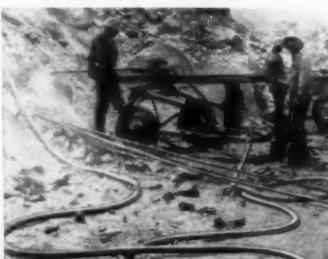
This is especially true of fire-resistant Thermocoal—the belt that bears acceptance designation #28-13 of the U. S. Bureau of Mines.

You'll not only have a belt that meets or exceeds all after-flame and after-glow tests . . . you'll also benefit from typical Thermoid toughness. Thermocoal Belts are engineered for high resistance to flexing and impact, edge wear, abrasion and mildew. You can specify either 4 or 6 ply construction of the strongest cotton or cotton-nylon duck—impregnated with specially compounded Thermoid rubber stocks to assure longer life, lower costs.

Your Thermoid Distributor can help you select the belting that meets your requirements. Contact him . . . or write direct for detailed information and data sheets.



*... and Hose manufactured
with your needs in mind.*



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Reclaiming Triple Superphosphate to Hopper

How Sauerman Scraper Storage Reduces Costs

200,000 tons of triple superphosphate are produced each year in this new Florida plant. It is delivered by overhead conveyor to a 329' x 146' storage building of 35,000 ton capacity. The material is then stockpiled and reclaimed by a 2½ cu. yd. Sauerman Scraper at a rate of 150 tph.

Here's how a Sauerman Machine cuts costs:

One operator, located in a safe station overseeing the entire area, can recover practically 100% of all stockpiled material.

All highly machined parts, hoists and motors can be located outside of the building and protected from corrosion and dust.

When parts are replaced—sheaves, clutch or brake linings—the machine is restored to practically new condition, even though it may be twenty or more years old.

Only the Crescent scraper and cables contact the material. The scraper machine can be designed to operate the scraper on top of non-caving material. This allows the scraper to break down any high faces that may be standing.

Sauerman Storage Machines are built for hourly capacities of from 20 to 600 cu. yds. A partial list of producers and manufacturers using some type of Sauerman equipment includes:

Consumer Cooperative Assn.
Crawford Chemical Co.

Davison Chemical Co.

Division of W. R. Grace & Co.

Duval Sulphur & Potash Co.

F. S. Royster Guano Co.

International Minerals & Chemical Corp.

Lion Oil Co.

Potash Company of America

Southern Agricultural Fertilizer Co.

Tennessee Farmers Cooperative

Virginia-Carolina Chemical Corp.

For ways to reduce your material handling costs, write to Sauerman's experienced engineers. Request Catalog E, *Bulk Storage by Scraper*, plus Field Report 227, and other reports on the handling of your material by Sauerman Machines.

SAUERMAN BROS. INC.

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Crescent Scrapers • Slackline and Tautline Cableways • Durolite Blocks

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continued thereafter for the balance of the year at an average rate of 7,550,000 pounds per month or 75 percent of plant capacity. Then on January 1, 1958 part of this was restored to yield production of about 88 percent of capacity. The company's contract for alumina purchases with *Reynolds Metals Company* terminates December 1, 1960.

WASHINGTON



Overall View of Storage

Drilling below the oxidized zone at the *Midnite* uranium mine in the Spokane Indian Reservation, southwestern Stevens County, Washington, has shown primary uraninite and coffinite, controlled by faults. Ore mined so far consists of the secondary mineral, meta-autunite, with minor uranophane and sooty uraninite. Eight ore bodies ranging up to 700 feet in length, 200 feet in width, and more than 150 feet in depth have been opened over a strike distance of 6,600 feet. The mine is operated by *Dawn Mining Company*, which has a 440-ton-per-day uranium processing plant at nearby Ford, Washington. J. J. Crowhurst, formerly with *Granduc Mines, Ltd.*, British Columbia, has succeeded R. B. Fulton as manager. Mr. Fulton has been transferred to the New York office of *Newmont Mining Corporation*, which controls Dawn.

In the Republic gold district of Ferry County, Washington *Flag Hill Mining Company* at last report was making five feet daily and approaching the estimated position of an ore body indicated by core drilling. Percy L. Bergt of Moses Lake is president and general manager; L. Harris, mine superintendent.

Northwest Magnesite Company has resumed mining and processing of magnesite at Chewelah, Stevens County, Washington, following a month's shutdown resulting from slowness of orders from eastern steel mills. About 200 men are on the payroll. Howard Ziebell is general manager.

Drilling and underground work by *Pend Oreille Mines and Metals Company* at its properties in the Metaline District of northern Pend Oreille County, Washington, has indicated enough zinc-lead ore for a 10,000-ton-per-day operation. Current production is about 2400 tons daily. Expansion of milling facilities will await straightening out of the import situation. Jens Jensen, Spokane, is president.

Utahcan, Inc. has resumed work at its Jim Creek mining district lead-silver-zinc holdings following a winter suspension. A flotation mill building started last fall is almost completed. About 100 tons of mill machinery have been trucked to the mill from the former *Young America* mill at Bossburg in northern Stevens County, Washington. Gordon Berkhang of Spokane is vice president.

Driving of a new lower tunnel is planned by *Highnoon Uranium Mines, Inc.* at its *Lost Creek* property in Pend Oreille County, Washington's Ruby Creek district. The tunnel will gain depth on an ore zone followed for 115 feet in a near-surface tunnel last season. About 130 tons of development ore were stockpiled. C. N. McJunkin of Hermiston, Oregon is president and Jean McClurg of Spokane, secretary.

precipitates—ROCKY MOUNTAIN

Third Uranium Conference Well Attended at Moab

Moab is still the uranium capitol of the United States. If you don't believe this, just ask any of the 450 registrants at the Third Uranium Symposium held in mid-May, reports George O. Argall, Jr., editor of *Mining World*, who has just returned from the three-day meeting.

Moab, Utah has changed, however, he observes. Instead of fast talking stock salesmen, dedicated, keen, young engineers talk about bit wing taper and hole size for dry drilling, instrumental control of uranium milling circuits, and blending formula for different ore grades.

All phases of the uranium industry in the United States were discussed at the three-day event sponsored by the Uranium Section of the AIME under section chairman Gordon Miner, Utah manager of Homestake Mining Company. The well planned program was directed by Philip Lindstrom, superintendent of Hecla Mining Company's Radon operation.

Many mills are now considering production of "Green Salts," reported Harry Gardner, metallurgical engineer, National Lead Company, Grand Junction, Colorado. He outlined several possible flowsheets and predicted that the AEC announcement of May 7 that commercial sales of concentrates will now be permitted under license will stimulate "Green Salt" production.

The first commercial application of flotation to domestic uranium ores was described by D. M. Pembridge, superintendent, Union Carbide Nuclear Company's Green River, Utah upgrading plant. At this plant a uranium-bearing carbonaceous (ashphaltum) material in Temple Mountain ores is separated by flotation. The concentrate carries 45 percent of uranium in feed. The plant has several other concentration circuits.

Carl Marquardt, Industrial Physics and Electronics Company, detailed successful instrumentation at Homestake-New Mexico Partners' new 750-ton-per-day mill at Ambrosia Lake, New Mexico.

The progress of many of the large uranium mining operations was revealed during the meetings. Ray Schultze, Rio de Oro Mining Company superintendent, stated that his firm has found that both tonnage and grade of ore will be higher at the Ambrosia Lake property than drilling had indicated.

According to K. G. Wallace, of Utah Construction Company, Lucky Me Uranium Company will strip 5,000,000 cubic yards and build up ore stockpiles from Nos. 1 and 4 open pits in Wyoming's Gas Hills area, this summer.

Utex Exploration Company has started pulling pillars at the Mi Vida mine, reported T. J. Barrett, assistant superintendent, while Maurice Brady, superintendent of Continental Materials, Inc., said that 78 tons of waste had been removed for each ton of ore mined at Continental's now completed big Battlesnake open pit (see *Mining World*, February 1956, pages 48-52.)

A lavish barbecue at Charlie Steen's beautiful desert retreat outside of Moab was a fitting climax to the very successful event.



Shattuck Denn Mining Corporation produced 62,759 pounds of uranium and 272,458 pounds of vanadium from its Uravan, Colorado operations in 1957. The property is operated under a lease from the U.S. Atomic Energy Commission, and, although continuously productive throughout the year, operated on a reduced scale because of the decline of known ore reserves. Through exploration work last year, additional small ore bodies were encountered. The lease with the AEC was to expire in May 1958, and at this writing negotiations were being carried on for an extension of that date.

Mineral Concentrates & Chemical Company, which is building a beryllium processing plant near Loveland, Colorado, expects to start accepting ore by June 15th. Initial capacity of the plant will be five tons per day. The plant will recover ore as beryllium hydroxide which can be reduced to a metallic state. According to company president L. Bernard Davis, the company will not reduce the ore to beryllium oxide because of the toxicity problem.

The *American Beryl Corporation* has erected a beryllium mill in the Buckhorn

Canyon of Colorado. According to John K. Banks, president, the mill has been tested and operations have been concluded as successful.

Leadville Lead Corporation filed an amendment to its DMEA exploration program at the *Dauntless Tunnel* in Park County, Colorado. About 2,500 feet of additional holes are being drilled. The company continues to ship ore to the *Asarco* smelter at Leadville despite the reduced lead prices.

Standard Uranium Corporation is continuing its development of lead-silver-zinc ore in the Crested Butte area of Colorado, particularly the *Micanber* property. The 250- to 300-ton mill is expected to go into operation in July.

Giant Resources Inc., has closed its *Little Dora* property near Silverton, Colorado where it had been mining lead, copper, gold, and silver. Shipments had been made to the *Pride* mill.

Among the recent Colorado incorporations are the following firms: *Smith Uranium and Oil Company* at Meeker, by Jules Singer, M. Keith Singer, and I. P. Rublack; *Gaddis Mining Company of Guatemala*, in Denver, by W. H. Gaddis, Kenneth E. Baker, and Loren E. Smith; *Famous Mines Inc.* in Denver, by Frank S. Sharai, M. S. Crist, and Mabel N. Scott; *Champion Ventures Inc.* in Denver, by D. F. McDermott, Elmer W. Lumberg, and C. E. Riddell; *Mining Associates Inc.* in Denver, by David F. Coolbaugh, Mary K. Coolbaugh, and Louis I. Hart, Jr.

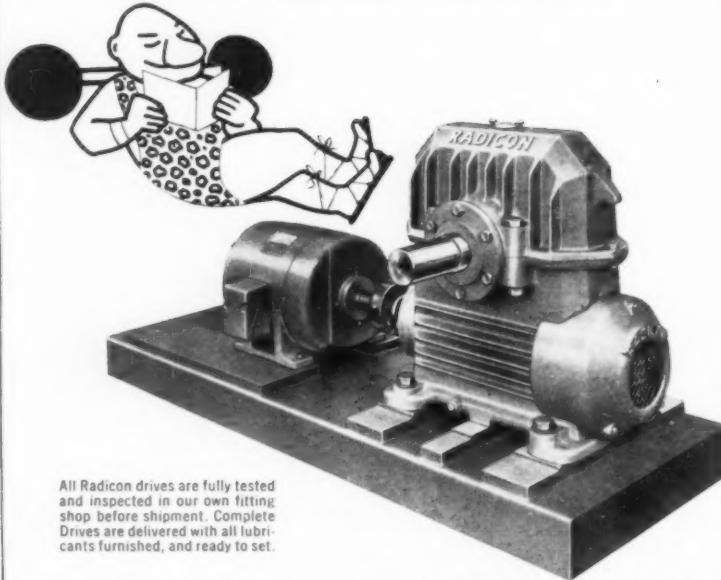


Richest U.O₈ Ore Load Delivered by Lisbon

The richest single truck load of uranium ore in the history of American mining, and the first shipment to qualify for the United States Atomic Energy Commission's \$10,000 "high-grade" bonus, was delivered by Lisbon Uranium Company of Salt Lake City, Utah, to the Grand Junction, Colorado AEC buying station recently. In 1948 the AEC, in an effort to stimulate interest of prospectors in the search for uranium, offered the bonus for the first shipment of 20 short tons of ore containing at least 20 percent uranium oxide. Carnotite-roscelite type ores, such as are found on the Colorado Plateau, were not eligible. Lisbon's ore, of the uraninite-pitchblende type, weighed in at 22.25 tons and assayed 22.92 percent U.O₈. The ore was taken from Lisbon's "Ike-Nixon" property near Moab, Utah. Total payment of \$61,016.72 was made for the ore, representing \$10,000 bonus and \$51,016.72 regular payment. Above, Lisbon's president, A. P. Kibbe (left), and Henry Sheelbline, district supervisor, test the ore with a Geiger counter before delivery to the AEC office. The delivery was made only a few hours before the 10-year-old offer expired. It is estimated that the 20-ton truck load of ore contained as much potential energy as several million tons of coal.

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American Smelting and Refining Corporation will sell its Garfield, Utah copper smelter to the Kennecott Copper Corporation for about \$20,000,000 in cash. The sale includes inventories of materials and supplies, adjacent real estate, and certain other assets of the smelter. Actual title transfer does not take place until January 2, 1959. Until then, Asarco will continue to operate the plant in accordance with present arrangements. Since principal ore for the Garfield smelter comes from Kennecott's Bingham mine, there should be no important changes in operating procedure. No change will be made in the jointly owned Garfield Chemical and Manufacturing Corporation, a large producer of sulfuric acid from smelter gases; each will retain 50 percent of the capital stock of this corporation. A record 391,740 tons of sulfuric acid was produced by Garfield Chemical in 1957, a 32 percent increase over 1956.

COG Minerals Corporation has been negotiating with the Atomic Energy Commission for permission to chemically process into "yellow cake" the products of its upgrading mill. The company developed and proved last year, a process for concentration of low-grade ores to commercial grade products at a 75-ton mill at Fry Camp, Utah. This pilot plant operation was later increased to 200 tons for a 20-day trial period. The company's Spook mine in the White Canyon of Utah was mechanized last year so that it is now able to produce up to 800 tons per day at substantially reduced unit mining costs, but is limited by restricted purchases of the Texas Zinc Minerals Corporation mill at Mexican Hat, Utah.

Royal Corporation is seeking a \$150,000 DMEA contract for uranium exploration in the Indian Creek area of San Juan County, Utah, where the firm has already produced 20,899 tons of ore. The company recently purchased the Boyles Brothers Drilling Company interests in this area, and acquired additional claims which it will prospect. The company was formerly called Royal Uranium Corporation.

Utah Copper Division of Kennecott Copper Corporation has awarded the \$16,000,000 contract for construction of a 75,000-kw steam-electric plant at the Magna copper mill to Rust Engineering Company of Pittsburgh, Pennsylvania. The addition will increase capacity of 175,000 kilowatts. The division is also experimenting with the use of three 20-inch cyclone ore classifiers at the Magna mill as possible substitutes for drag classification. The ore haulage tunnel being driven at Bingham Canyon mine is more than half-way to its ultimate length of 18,000 linear feet, and it appears that the project may be completed in November, seven months ahead of schedule.

At the Ransom uranium mine near Blanding, Utah, Sunshine Mining Company of Spokane, Washington is mining ore reserves estimated at 6,000 tons at the beginning of this year. Production in 1957 totaled 8,628 tons averaging 0.25 percent uranium oxide.

recipe for YELLOW CAKE

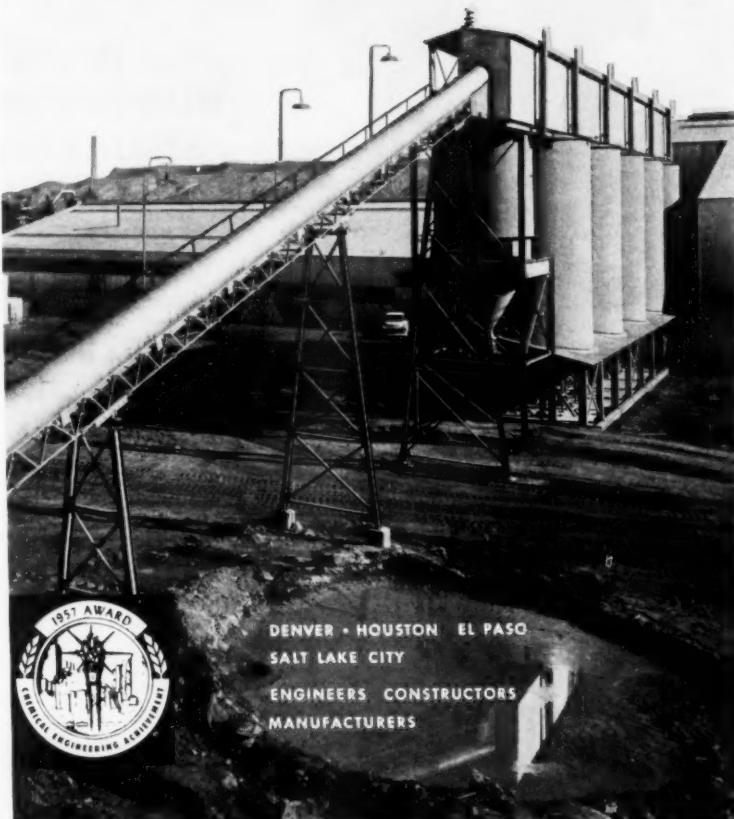
Good equipment properly arranged produces a better cake. This processing mill, built by Stearns-Roger, is an efficient work shop for uranium processing.

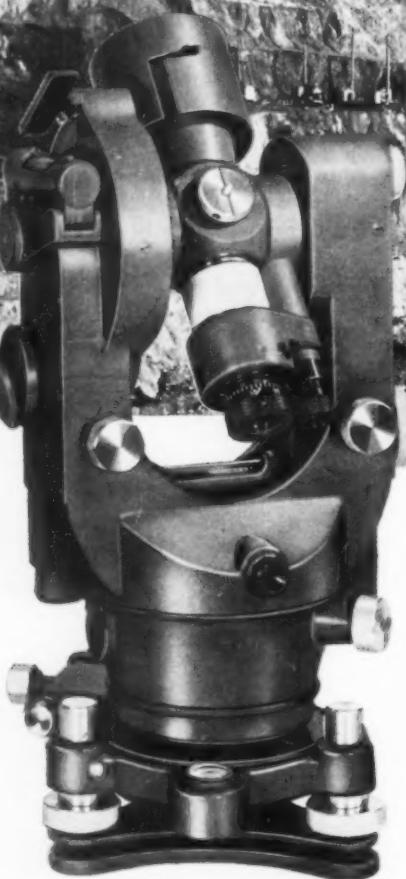
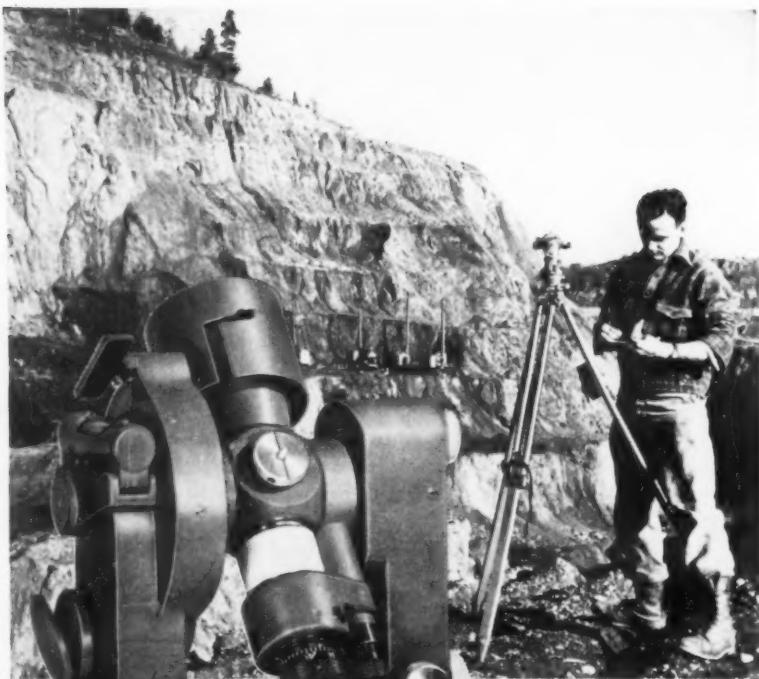
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ROCKY MOUNTAIN



Columbia-Geneva Steel Division of U.S. Steel Corporation has taken an option on one-half of the water rights of the famous *Hay Ranch* on Sweetwater River in Wyoming. The steel firm has until January 1, 1959 to exercise its option. This water will probably be left in the stream to replace water taken out further upstream for the proposed ore beneficiation plant at *Atlantic City*. The company has resumed testing of iron ore deposits at the project. Three carloads of ore were sent to a U.S. Steel laboratory at Duluth, Minnesota in April, and drilling will be continued throughout the summer. Last summer 3,000 tons of ore were sent to the laboratory. In recent months, U.S. Steel has also acquired the *Robin Hood* claims 1-7, in the South Pass country, from Frank C. and Helen Mayson and Ronald and Dorothy Hester, all of Rock Springs.

Shoni Uranium Corporation started pre-mine stripping operations at the *Bonanza* mine in the Copper Mountain mining area of Wyoming, the first major open-pit operation in the district. *Ned R. Shelley Construction Company* is working on the contract for removal of overburden which will total 230,000 cubic yards. It is reported that the pit will reach a depth over 80 feet.

An additional 1,700 tons of daily milling capacity will be granted in Wyoming by the *Atomic Energy Commission*. The state now has a daily mill capacity of 1,650 tons, represented in the 400-ton mill of *Western Nuclear Corporation* at Jeffrey City, the 750-ton mill of *Lucky Mc Corporation* in the Gas Hills which began operations in February this year, and the 500-ton mill under construction at Riverton for *Fremont Minerals, Inc.*, scheduled to begin operations about January 1, 1959. *Lucky Mc Corporation* has asked for permission of the *Atomic Energy Commission* to increase capacity by 1,000 more tons daily, and *Western Nuclear Corporation* has petitioned for an 800-ton increase. Three applications are before the *Atomic Energy Commission* for additional mills. *Globe Mining Company* and *Union Carbide Nuclear* have jointly asked for a 1,000-ton mill; *Gas Hills Uranium Corporation* and *Federal Uranium Corporation* have jointly applied for a 500-ton mill; and *Vitro Minerals Corporation* and *Lisbon Uranium Corporation* have jointly applied for a 1000-ton mill.

At the *Wyoming Mining Association's* convention at Casper in April, *Western Nuclear Corporation* president, Robert W. Adams, was presented with the "Bucking Bronco" certificate by Governor Milward L. Simpson for his contribution to the Wyoming uranium industry.

An ore body between 160 and 200 feet in depth has been blocked out by *Antelope Mines* in the Shirley Basin of Wyoming. The firm acquired 38 claims in the area last year. N. P. Juneman, manager, announced that the firm would concentrate its efforts in 1958 in extensive drilling in the Shirley Basin, farming out the Gas Hills properties so that mining operations can be started.

precipitates—CENTRAL AND EASTERN



The Viburnum shaft being sunk by *St. Joseph Lead Company* at Viburnum, Missouri, is making steady progress at a rate of about 40 feet per week. The 780-foot shaft is expected to be completed sometime late this summer. At Sullivan, Missouri, another St. Joe interest, the *Meramec Mining Company*, has bought 55 acres in two tracts at the edge of the city for development of housing facilities for employees. At the iron mine site, the shaft is being sunk to around 1,500 feet for further exploration work. The right-of-way for the railroad to the *Pea Ridge* deposit has already been purchased but it will probably not be built for another year and a half. St. Joe shares its interest in Meramec with *Bethlehem Steel Corporation*.

The first iron ore jig processing mill has been installed in West Plains, Missouri by the *McLain and Allen Mining Corporation*. The jig is said to have improved the quality of the ore prepared for shipment by 75 percent. If the jig processing program proves satisfactory, the company plans to install a larger separation mill to process all ore mined in the area.

United States Metals Refining Company, subsidiary of *American Metal Climax Inc.*, is reported to be running pilot plant tests on copper-bearing ore from an operation near Houghton, Michigan. The pilot plant has been set up by the *Michigan College of Mining and Technology* in Houghton. The firm also has been conducting an extensive drilling program on the Keweenawan formation north of Wakefield in Gogebic County, Michigan where the company has estimated a deposit of about 50,600,000 short tons of copper-bearing shale exists with an average content of 1.52 percent, as well as 54,000,000 short tons of lower-grade shale with an average content of 1.04 percent.

American Smelting and Refining Company has been attracted to the recent iron ore discoveries in Missouri and is reported to be sending a crew to investigate the state's mineral resources. One area of possible interest to Asarco should be the Peace Valley area of Howell County where a deep iron deposit is reported by the Division of Resources and Development.

Southern Illinois Mining Company has leased the barge loading facilities of *Rosiclare Lead and Fluorspar Mining Company* on the Ohio River at Rosiclare. Southern Illinois Mining will repair and improve the facilities, and plans to ship fluorspar from its operation in Hardin County via the barge.

The slackening demand for titanium has caused *Allied Chemical & Dye Company* and *Kenncott Copper Corporation* to defer their plans for construction of a titanium plant. A major producer, *DuPont Company*, has cut the price of A-1 titanium sponge 20¢ per pound to \$2.05, and A-2 has been cut 15¢ per pound to \$1.85. *Titanium Metals Corporation of America* and *Electro Metallurgical Division of Union Carbide Corporation* are expected to follow suit. *Dow Chemical Company's*

sponge plant closed last June, and *Cramet Inc.* is closing its plant and returning it to the *General Services Administration*. Broadening of the market for titanium sponge seems to be the only hope for these producers who had been selling almost exclusively to the government under "incentive" contracts.

Activities in the Rosiclare district of Illinois are slowing down somewhat. The Rosiclare Works of the *Aluminum Company of America* has placed its operations on a four-day week, and has made certain reductions in the work forces. All of the fluorspar mined and milled at the Rosiclare Works is used by Alcoa in making aluminum. The *Ozark-Mahoning Mining Company*, large acid-grade fluorspar producer, has placed its Rosiclare mill on a five-day week. The *Minerva Oil Company* released part of its crew in the *Crystal* mine where most of the county's metallurgical grade fluorspar is mined.

Eagle-Picher Company's zinc smelter at Henryetta, Oklahoma has been shut down indefinitely pending an improvement in the zinc market. Operations had only been resumed last November after a four-month strike closed the plant in July. The company reports that its Mining and Smelting Division expanded its rare metals plant at Miami, Oklahoma during 1957 to produce silicon which is now being made and sold commercially in small quantities.

Quincy Mining Company, Hancock, Michigan, has closed down all its copper production facilities, including the reclamation plant and smelter near Hubbell, Michigan. Continuous reduction in copper prices created this shutdown on these facilities which had been in continuous operation since 1943. The reclamation plant recovered copper values from tailings deposited in Torch Lake during previous operations.



Alan Wood Steel Company now expects its new iron powder plant to be completed earlier than originally planned. New target date for the 50-ton-per-day operation is early in 1959. It is being built adjacent to the steel works in Conshohocken, Pennsylvania. According to Jerome F. Kuzmick, Powder Metal Consultant, this will be the first commercial plant to use a workable "fluid bed" process for direct reduction of iron ore, wherein particles of iron ore concentrate are suspended in a stream of hot hydrogen gas until reduction is completed.

Foote Mineral Company is now recovering mica as a byproduct of its lithium operations at Kings Mountain, North Carolina.

The *Seventh National Clay Conference* will be held on October 20 to 23 at the U.S. National Museum in the Natural History Building, Smithsonian Institute, Washington, D.C. It is sponsored by the Clay Minerals Committee of the National Research Council and is under the chairmanship of Dr. H. F. McMurdie of the National Bureau of Standards. A principal theme for the conference will be "Geology

of Clay Deposits." However, papers will also be presented on other phases of the broad subject of "Clays and Clay Minerals." A field excursion is planned for Monday, October 20, to typical clay deposits and soil profiles in northeastern Maryland and northern Delaware. A guided tour to the National Bureau of Standards is being arranged for the afternoon of the 22nd. Complete details of the program will be announced in August.

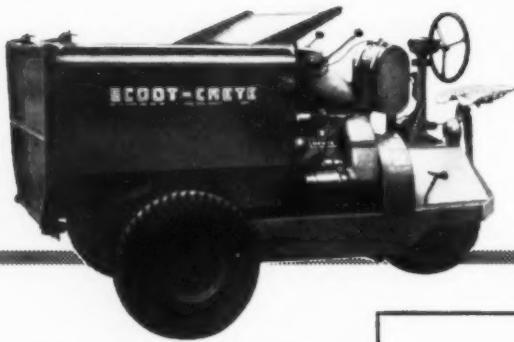
National Lead Company has greatly curtailed operations in Tennessee. The barite mine which produced chemical-grade barite at Sweetwater has been closed. The zinc exploration program at Treadway in Grainger County has also been suspended. National Lead has been diamond drilling a group of leases purchased from *Putnam Exploration Company*. This program was partially financed by a \$85,063 DMEA loan. *Joy Manufacturing Company* was the drilling contractor.

A geologic survey of the high-grade feldspar reserve at the Cold River, New Hampshire property of *Foote Mineral Company* has shown an easily accessible reserve for at least two years. A decision will be made this year on whether to continue exploratory diamond drilling. The company has acquired a 54-acre tract of land near Exton, Pennsylvania as a site for a possible future research and engineering center. A pure silicon metal facility will be built here.

Bear Creek Mining Company has closed its temporary exploration office in Washington, North Carolina. According to local sources, there are two possible reasons for this action: the inability to acquire the needed land, plus the action of the Council of State in not acting on Bear Creek's bid for underwater lands of the Pamlico and Pungo Rivers. The company was seeking phosphate deposits.

Cramet, Inc. of Chattanooga, Tennessee, manufacturer of titanium sponge, will close its plant because of sharply lowered demand. Cramet is jointly owned by *Republic Steel Corporation* and *Crane Company*. The \$25,000,000 plant will be turned over to the federal government who financed its construction. Cramet was originally formed by *Crane Company* in 1953, and with a \$24,950,000 advance from the government, built the Chattanooga installation with a capacity of 6,000 tons of sponge annually. Republic acquired a half interest in June 1956.

Development of a new process for extracting alumina from relatively low-grade domestic clays has led several metals firms to explore the sandhills of North and South Carolina for deposits of red and white alumina clay. Other minerals in these states are also attracting attention. Deep-lying phosphate deposits are being investigated in northeastern North Carolina where mining rights on 60,000 acres of land have been leased in one region. The phosphorites located there contain from 8 to 31 percent P₂O₅ and are covered by 45 to 250 feet of overburden. The southern tip of South Carolina is being explored for similar deposits. The sands along the north central coast of North Carolina bear titanium, and both titanium and zirconium ores have been found in central South Carolina. Some 80 percent of all United States lithium deposits are near the west central Carolina border region.



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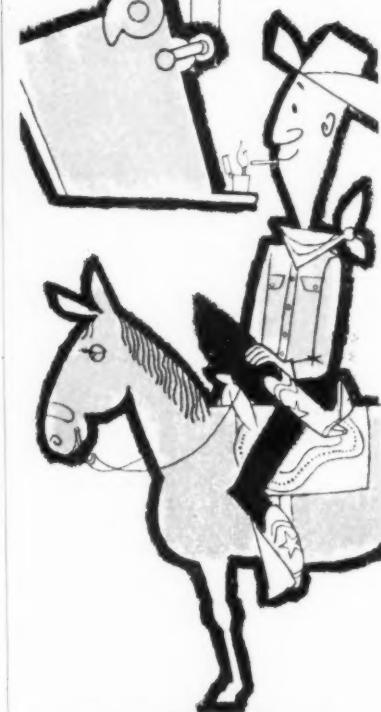
PARTIAL SPECIFICATIONS TABLE

Model	Cont. BHP/Cont. RPM
F 1 L 612	10/2000
F 2 L 612	20/2000
F 3 L 612	30/2000
F 4 L 612	40/2000
F 6 L 612	60/2000
A/F 2 L 514	30/1600
A/F 3 L 514	45/1600
A 4 L 514	60/1800
A 6 L 514/614	90/1800
A 8 L 614	120/1800
A 12 L 614	180/1800

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First iron mine to go into operation on the Mesabi Range this season was the *Douglas* mine of *M. A. Hanna Company* which started production during the week of April 14. Most others held off until the middle of May. The majority of plants and mines will operate on a reduced schedule for the entire season because of the reduced steel production schedules and consequent lessening demand for iron ore.

The *United States Steel Corporation* has decided against any immediate construction of the large taconite plant it has had under consideration for Minnesota since the successful operation of the *Pilotac* pilot plant got under way in 1953. The company feels there is no need for increased taconite output at this time, when Minnesota's iron mines are operating at a reduced pace.

Cleveland-Cliffs Iron Company expects to operate only 10 of its 16 Great Lakes vessels this year. The company reports it is seeking every possible means to minimize the reduction. Sales efforts have been redoubled and industrial engineering teams have been used to seek every possible efficiency. Work schedules have been reduced and cost cutting programs have brought major economies. The firm's management speculates that even with an upturn in steel production later this year, only about 90,000,000 tons of steel ingots will be produced, compared with 113,000,000 tons in 1957.

Oglebay Norton Company of Cleveland, Ohio has been appointed exclusive agent for the sale of 1,500,000 tons of Silver Bay taconite pellets produced by the *Reserve Mining Company* for delivery during the 1958 navigation season. The pellets are produced at the Silver Bay plant in Minnesota. Last year 5,000,000 tons were produced. The firm has announced this year that it will go on a reduced operational schedule of one week off and four weeks on during the season.

Snyder Mining Company is currently revamping its loading arrangements at the *Godfrey* underground mine near Chisholm, Minnesota. This project involves the installation of 3,200 feet of conveyor belt on the main haulage level and will result in complete conveyor haulage from the various mining areas to the shaft.

Jones and Laughlin Steel Corporation has postponed construction of the *Lind Greenway* mine beneficiation facilities. This plant was originally scheduled for construction during 1958 and operation in 1959. It was to include washing, heavy media, and jig sections.

Correction on Mesabi Practice

The title of Mr. Erickson's article on page 51 of the April 15th issue which read as follows, "After 50 Years of Iron Beneficiation the World Still Copies Mesabi Range Practice," was selected by the Editorial staff. Mr. Erickson has informed us that his personal views are diametrically opposed to the implications of this title.

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A carload of manganese ore has been shipped from the *Tres de Mayo* mine, 12 miles north of Nogales, Arizona, to *Mo-have Mining and Milling Company* at Wickenburg, Arizona. The mine is being worked under a leasing agreement by Frank O. Otero, and Rupert Beverle, both of Nogales. Since acquiring the lease last February, the present operators have built about two miles of road and are now sinking an inclined shaft, now down about 35 feet. Most of the material removed in the shaft sinking is manganese ore which is trucked to Patagonia and then sent by rail to Wickenburg.

Kennecott Copper Corporation reports that copper production from its *Ray Mines Division*, Ray, Arizona, totaled 56,879 tons in 1957, compared to 53,248 tons in 1956. The increase occurred despite a reduction in operations from 7 days a week to 6 days, effective April 7, 1957, and was due primarily to the greater production of low-cost precipitate copper obtained by leaching the caved areas of the old underground mine. A total of 17,712 tons of copper was obtained from that source in 1957, compared to 14,934 tons in 1956. Plans for expanding the productive capacity of the

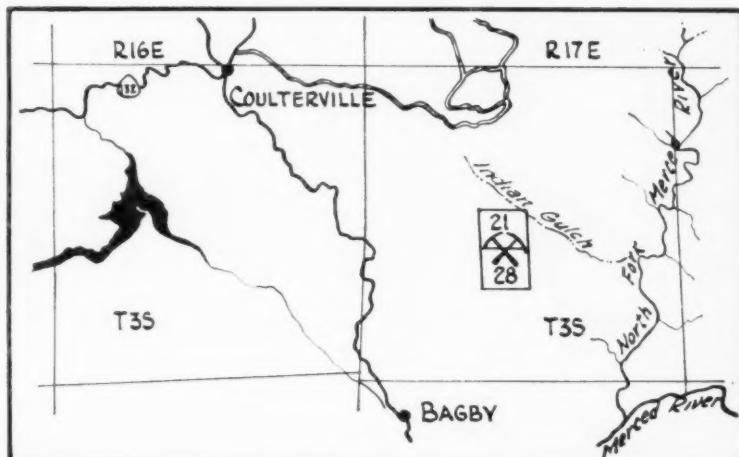
Ray mines by 20,000 tons of copper annually are proceeding on schedule. Construction of the smelter is well advanced and is expected to be completed by the middle of the current year, and expansion of the mill should be completed by the middle of 1959. As completion of the program will mean additional personnel, some 600 new houses are being erected. During 1957 the Ray division mined and milled 4,751,463 tons of ore with a copper content of 19.0 pounds of copper per ton, compared to 5,852,742 tons mined and milled in 1956 with a copper content of 18.1 pounds copper per ton. For the third time this year, production has been curtailed. The latest cut reduced output from the mine and mill by 20 percent. This placed output at about two-thirds of 1957 production, which came to 387,291 tons. Previous reductions were made in January when the seven-day week was reduced to six, and in March when a five-day week was established. The move is intended to bring production more nearly in line with current demand and to prevent further inventory increases.

Inspiration Consolidated Copper Company, Inspiration, Arizona, has completed the construction of the treatment plant for the recovery of molybdenum from its ores. Inspiration copper ores contain only minor amounts of molybdenum, but extensive test work in 1957 and prior years established the feasibility of its recovery as a by-product by retreatment of the copper concentrates. Cost of the new

facilities was estimated at \$561,132. The management comments that since the metallurgical problems of by-product molybdenum recovery are complex, it probably will be several months after completion of the plant before full-scale production can be achieved. Inspiration in 1957 mined 4,456,378 tons of ore with a total copper content of 0.892 percent. Recovery was 16.10 pounds per ton of ore treated. Total copper production, from ores and from leaching-in-place, was 71,456,881 pounds.

International Smelting and Refining Company at Miami, Arizona, has reduced the work week for its smelter employees from five to four days. Harold Foard, smelter superintendent, stated that the adjustment in working schedule for the Miami plant was made necessary by the cut-back in production at *Miami Copper Company's* underground division. No major layoffs are planned, he said, but about 200 men are affected by the cut-back in the work week. Employees were put on a five-day week last July when production cuts were made by the mines of the district.

San Manuel Copper Corporation at San Manuel, Arizona, has placed its employees on a straight five-day work week. According to General Manager Frank Buchella, the step was taken because of present economic conditions. The mine, mill, and smelter will continue to operate three shifts daily, seven days a week, but the new schedule will eliminate over-

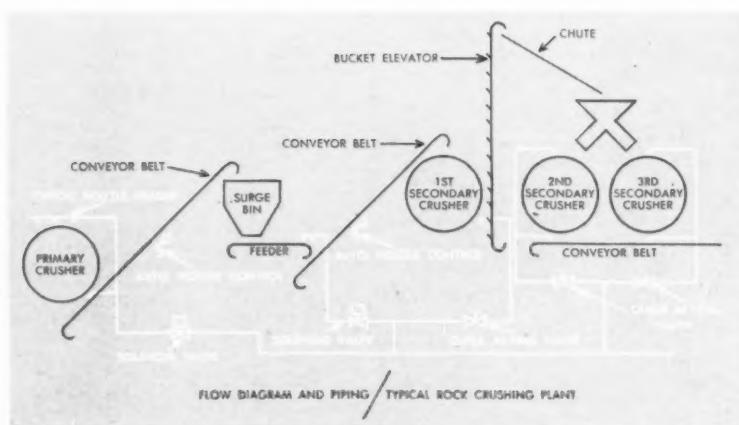


Molybdenum Corporation Seeks Base Metals on California's Mother Lode

A recently discovered copper-zinc-gold-silver deposit in California's famed Mother Lode is being explored by *Molybdenum Corporation of America*. The March issue of *Mining World* carried a short report on this work while the annual report of *Molybdenum Corporation* announced that "drilling to date suggests that the mineralization is extensive." The photograph above shows the diamond drill set up to collar the eighth hole in the exploration program which was started in November. Progress was slowed by winter storms. The location of the work southwest of Coulterville, Mariposa County, California is shown on the place-fix map. On September 20th, 1957, *Molybdenum Corporation* leased and optioned until September 30, 1958 certain claims of John, Nick, and Adeline Guisto of Bagby, California. These claims—Mamya, Two Bit, Four Bit, and Six Bit, Dollar, and Black Oak—were located by the Guistos from April 23, 1955 to September 1, 1957. They are in Sections 21 and 28, T. 3 S., R. 17 E., M. D. B. M. Surface rights are held by Coulterville rancher Clair Schilling who reports nothing has been leased as yet, although

Molybdenum Corporation president Max Hirsch and other company officials and engineers have been interested in mill sites, water rights, road, power and water rights of way. Water supply in the dry summer and fall months might present a problem so pumping of water from the deep North Fork Merced River Canyon several miles to the east has been considered. The discovery is surrounded by gold mines and several old prospect shafts were sunk on the gossan and below it. The surface is a brush covered, iron stained hillside showing no sulphides. A few feet below the surface, pyrite in bleached and altered schistose metasediments of the Mother Lode was found by drilling. A few feet deeper, the base metal sulphides were located. This type of mineralization, while not common on the Mother Lode proper, has been developed into several good zinc-copper-gold mines on the West Belt. The most famous of these is the Penn mine at Camp Seco, Calaveras County, to the north, and the Blue Moon in Mariposa County to the south; in fact, the gossan and outcrop at the Penn mine is similar to that at the Guisto property.

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time work at premium pay in an effort to hold down costs. Some additional employees are being hired to fill in gaps created by stopping the 48-hour week. There have been approximately 2,600 employees on the San Manuel payroll, of which approximately 2,100 are at work on any one day.



The hunt for boron continues to center in Kern County, California. W. Scott Russell of Los Angeles is reported to have leased 650 acres immediately east of the Mojave Marine Base near Mojave, California. The leases, acquired from Fred B. Knowles, Geneva D. Knowles, Glenn H. Knowles, and Lillian M. Knowles, are for five years and provide for start of mining operations within one year. Remainder of the leased property came through a 25-year agreement with *Southern Pacific Land Company*. Under this contract, Mr. Russell is to start drilling a test hole on this property before March 1, 1961.

The old *Barrett* gold mine near Sonora, California is being reopened by Ernest E. Joy of Panaca, Nevada and his sister, Mrs. Elsie Hoy of El Cerrito. The property consists of five claims and was last worked in 1938. The new operators intend to sink two winzes at favorable points on the vein, and to drive a ventilation raise which will also explore the ore body.

The *Siskon Corporation* has reopened its *Siskon* mill in Siskiyou County, California for the new season. Exploration work will be undertaken in four separate places to locate a possible gold ore zone. The company does not plan to reopen the *Old Reliable* copper mine this year unless the price of copper should rise considerably. Drilling in 1957 did not develop any appreciable amounts of new copper ore reserves. It appears that the *Old Reliable*, *Prince*, and *Globe* properties will be inactive for some time.



Construction of a 100-ton scheelite mill is planned by *Tungsten Mountain Mining Company* at its mine near Fallon, Nevada. A five-foot vein of high-grade has been opened in a new lower level adit driven under a \$32,200 contract with the Defense Minerals Exploration Administration. Bennett W. Porter of Seattle, Washington is president and treasurer, and Arthur Lakes, consulting engineer and geologist.

Nevada mines will continue to supply Japan with iron ore until at least 1967, according to Elmo E. Ferrari, director of the Port of Stockton (California), who has just returned from a mission to Japan. Such steel firms as *Yawata Iron and Steel Company* and *Fuji Iron and Steel Company* have expressed interest in continuing the ore shipments. One of the Nevada mining companies, *Standard*

Slag Company, reports it is shipping to Japan at a rate of 25,000 long tons per month from the *Minnesota* mine near Yerington. Last year shipments from this operation averaged about 55,000 long tons per month.

United States Mining and Milling Corporation has changed its name to *United States Milling and Minerals Corporation*. The firm poured its first gold-silver ingots at the Silver Peak mill in Nevada in April and is now producing at 10-day intervals. Enough ore had been stockpiled to supply the 400-ton mill for several months, but custom ore is also sought. Additional ore will come later from the firm's *Nivloc* mine which is being readied for renewed production. The *Nivloc* mine and Silver Peak mill were acquired by U.S. Milling for Avery Brundage.

Basic Inc. is undertaking a \$2,000,000 improvement program at its ore dressing facilities in Gabbs, Nevada. The additions are designed to extend the life of the ore body and "to improve the quality and broaden the usefulness of the products from the property where the company mines and processes magnesite and brucite for manufacture into magnesia refractories." Basic also has a share in a syndicate formed to discover sulphide ore bodies through use of airborne electromagnetic instruments. Study to date reportedly has uncovered a number of interesting prospects which will be explored by core drilling this year.

The diatomaceous earth plant being erected by *Kaiser Engineers* for *The Eagle-Picher Company* at Lovelock, Nevada is scheduled to be completed in August. Kaiser will also install the machinery which includes a 9- by 120-foot, rotary kiln, blowers, cyclones, traps, and air heater. Before proceeding with plant design and construction work, Kaiser had also performed the exploration and geological work on the open-pit mine site about 25 miles away. The plant, when operating at capacity, will produce 36,000 tons of natural and calcined filter aids annually. Eagle-Picher's investment in this project amounts to about \$2,500,000.



A new corporation, *New Mexico-Arizona Processing Company Inc.*, has set up an operation to up-grade tailings from the mill of *Manganese Corporation* 10 miles south of Socorro. The operation reportedly has a daily capacity of 500 tons.

Ray C. Wood has reactivated the *Cliff Ray* manganese mines in the Red Rock mining district in Grant County, New Mexico. A small underground operation, the mine was abandoned about a year ago after being worked by *Wilkford McGrath* of Duncan, Arizona.

An eight-mile highway from the intersection of the San Mateo and Ambrosia Lake roads into the Ambrosia Lake uranium district will be paved by the New Mexico State Highway Commission at an estimated cost of about \$150,000. Traffic on this road has been steadily increasing with the growth of the mining and milling operations.

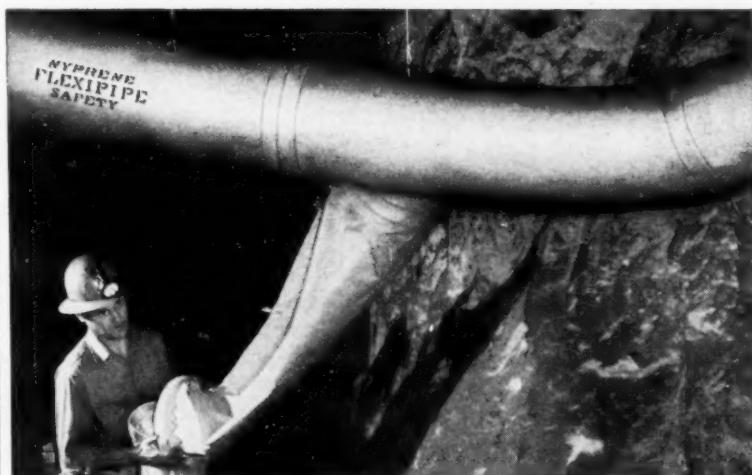
A total of \$760,386 reportedly was paid by the DMEA to New Mexico firms in 1957. Luna County operators received \$19,920 for manganese exploration; McKinley County uranium companies received \$229,966; and a Taos County firm, \$510,500 for molybdenum. The government participation was 75 percent of the total contracts for manganese exploration and 50 percent for uranium and molybdenum.

Rare Metals Corporation of America is making steady progress in its sinking of a 1,100-foot vertical shaft to reach the uranium ore body on its property in the Ambrosia Lake district of New Mexico. Initial mining operations are expected to start early in 1959. Exploration has

proven at least 700,000 tons and the firm believes this to be a conservative estimate which will be increased as the ore body is further explored. Two other deposits have been located on the property and these will be explored through further drilling this year. The company has an option on one other property in the Ambrosia district and this also is to be explored this year. An application has been filed with the DMEA for financial assistance for the project.

A new mining corporation, *W.C.T. Engineering Company*, has been organized in Belen, New Mexico. The firm will operate properties in McKinley County, New Mexico, and in the Moab and Blanding areas of Utah. Functions will include exploration and milling. Perry Tilson of

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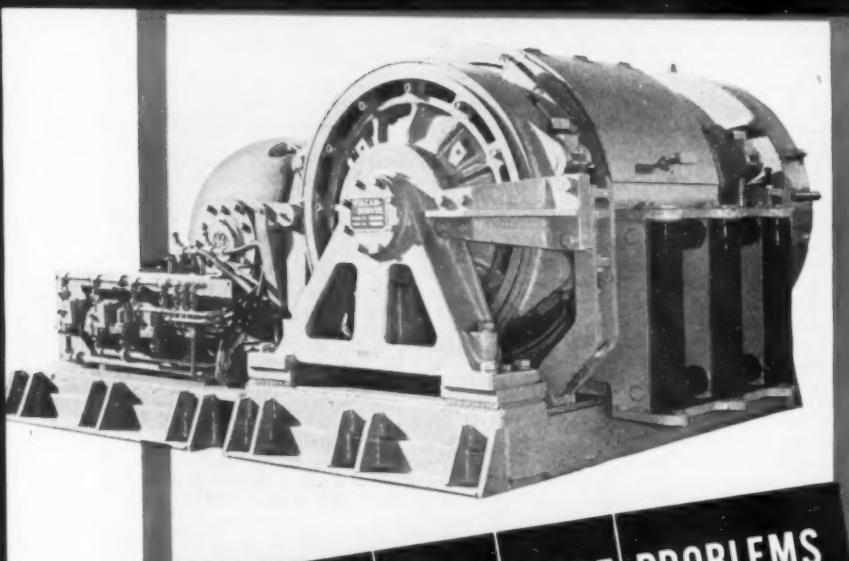
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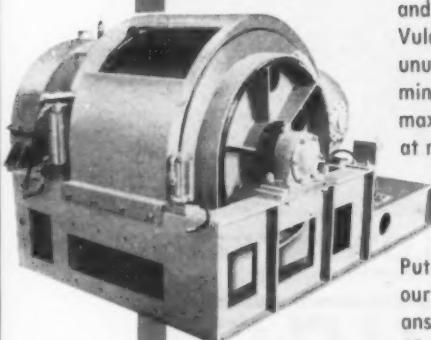
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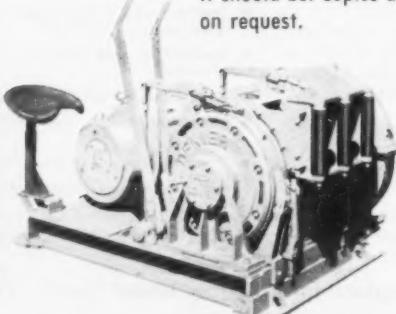


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According to John Q. St. Clair, consulting geologist for *Rio de Oro Uranium Mines*, the *Dysart* mine in the Ambrosia Lake district of New Mexico had estimated ore reserves on December 31, 1957 of 1,340,375 short tons, with an average grade of 0.253 percent uranium oxide contained. This includes about 106,909 short tons of ore mined prior to that date and still in stockpile. In Sec. 26, T. 14 N., R. 9 W., estimated ore reserves at year's end were 359,210 short tons with an average grade of 0.333 percent uranium oxide.

Patten and Gallassini have taken over operation of the *United States Smelting, Mining & Refining Company's Continental* mine near Silver City, New Mexico. Former lessees of the lead-zinc property were *McFarland & Hullinger*. *Patten & Gallassini* continue to operate the *Princ*ess shaft at Bayard.



The *General Services Administration* is offering for sale approximately 300,000 long tons of government-owned, low-grade Mexican manganese ore. The ore, located at El Paso, Texas, averages about 30.47 percent contained manganese. It will be sold on the basis of "where is, as is, all or none," or on the basis of unloaded weights and analysis "all or none." The ore is offered with U. S. customs duty paid. Interested parties should contact the *CSA Defense Materials Service* at 17th and D Streets, S.W., Washington 25, D.C.

Dow Chemical Company has purchased 100 acres of land in Marathon, Texas and is building loading facilities for shipping fluorspar ore. The site is at Heath Canyon on the Rio Grande, approximately 15 miles east of Big Bend National Park. The ore is trucked in from Mexico.

Reynolds Metals Company has closed down half of one potline at its aluminum reduction plant in Corpus Christi, Texas, as part of a company-wide program to bring production into line with current demand. This partial shutdown reduces the plant's output by 25 percent.

Small amounts of tungsten concentrates from *Wah Chang Corporation* operations in Brazil are currently being processed at the firm's recently acquired Texas City, Texas smelter. The plant is also making a pilot run of 1,000 tons of high-grade Indonesian tin concentrate to determine whether the metal can be processed at internationally competitive prices.

American Smelting and Refining Company has curtailed production at its Amarillo, Texas smelter by 12.5 percent. One of the eight blocks of retorts which had been operating has been shut down. This smelter produces Prime Western zinc. At the company's Corpus Christi electrolytic refinery, a major addition has been completed which will handle production of the entire range of zinc alloys sold by the firm's Federated Metals Division.

INTERNATIONAL NEWS

Sedren Develops Copper Deposits in Haiti

Important copper deposits are under development by Sedren S. A., a wholly owned subsidiary of Consolidated Halliwell Limited (Canada), in the Terre Neuve district of Haiti. The company has carried out an extensive exploration program, including aerial photography and airborne magnetometer surveys, over a 100-square-mile area 15 miles north of the city of Gonavas, and ore reserves are now estimated at 5,200,000 tons grading 1.7 percent Cu. Development is centered in the Meme zone, where deposits total 1,800,000 tons of 2.5 percent Cu.

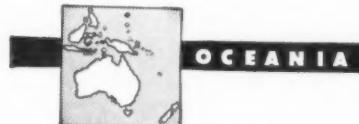
To date over 64,000 feet of surface diamond drilling has been done, mainly at Meme and Casseus. Underground diamond drilling is currently in progress in the Meme ore body where over 6,000 feet have been completed.

Underground work has been confined to the development of the Meme ore body. Three adits with a level interval of about 170 feet have been driven. Total footage involved in driving adits, drifts, crosscuts, and raises is more than 4,000 feet and preliminary work and a pilot raise for a 3-compartment internal shaft have been started.

A main access road into the property has been developed, 15 kilometers long by 14 to 20 meters wide, involving considerable excavation, grading, and drainage culvert emplacement.

The most complete camp has been established at Meme, where living quarters have been constructed and a shop, power plant, warehouse, office, mess, hospital, and related facilities are in operation. A complete Assay Laboratory and a new 40- by 100-foot warehouse are the two permanent structures which have been completed. Excavation of the sites for the mill, power plant, permanent shops, and hospital is nearly complete.

Expenditures of more than \$2,500,000 have been invested in the project.



NORTHERN TERRITORY—United Uranium N.L. at South Alligator River has been designated by the United Kingdom Atomic Energy Authority as a beneficiary under the guarantee given by the Authority to the Commonwealth government to purchase uranium oxide from the South Alligator River areas. Details of the contract are expected to be finalized soon. South Alligator Uranium N.L. has also stated that its production will be purchased by the United Kingdom Authority. At El Shera, United Uranium N.L. has started open-pit mining of 20,000 tons of ore to stockpile at the former Northern Hercules mill at Pine Creek for treatment during the wet season.

REPUBLIC OF THE PHILIPPINES—Lepanto Consolidated Mining Company has had an expert from the United States testing its prospect on Mindanao for its placer gold potential. Another mineralized area on the property was first explored for its native copper, but work was suspended when not enough copper was developed in the area tested, especially with the low price of copper.

NEW ZEALAND—Kanieri Gold Dredging Ltd. at Taramakau continues to report good gold recoveries. In eleven months of the fiscal year ended in February, 12,172 ounces of 950 fine bullion were recovered from 3,925,000 cubic yards dredged.

REPUBLIC OF THE PHILIPPINES—Banquet Exploration Inc. treated 754 tons of ore for a recovery of 376.262 ounces of gold in February, and 764 tons for a recovery of 427 ounces in March. The mill has been in operation since last September. For a time, the program was beset by foreign exchange problems for bringing in supplies to enable the mill to operate at its rated capacity of 50 tons per day. The company was granted foreign exchange allocation for the second semester to alleviate this situation.

TASMANIA—The Electrolytic Zinc Company of Australasia Ltd. at Risdon continues to report high output of concentrates from its west coast mines at Rosebery and of zinc from its Risdon refinery. The company has been unaffected by the stockpiling of zinc concentrates at Broken Hill, New South Wales, or by the 10 percent reduction in working time at Broken Hill. In three recent four-week periods, zinc tonnages were as follows: 8,787, 8,768, 8,605; ore treated was 12,504, 14,035, 14,298; lead concentrates produced were 650 tons, 714 tons, 760 tons; zinc concentrates produced were 3,390, 3,839, 4,282; copper concentrates produced were 443 tons, 447 tons, 465 tons.

REPUBLIC OF THE PHILIPPINES—Base metal mine operators have asked for government assistance to enable them to survive until world metal prices recover. A bill has been introduced in the Senate as the "Base Metals Incentive Act of the Philippines." It provides for partial price supports for copper and iron ore producers particularly. No direct financial appropriations are requested because the bill calls for use of part of the taxes paid by the base metal companies to cover the incentive program. Under the bill, the government would assure producers of a minimum price on this schedule: 54 centavos per pound for copper; 20 pesos per metric ton for iron ore. Also, any copper, iron ore, refractory or metallurgical chrome, manganese, or quicksilver producer will be entitled to incentive assistance in the form of loans "sufficient to meet 80 percent of the value of any production placed in stockpile during the effective time when temporary loss of market renders sales impossible in the world market." The loans are to be repaid immediately, or as soon as sales are resumed.

NEW GUINEA—Bulolo Ltd. dredged 4,273,900 cubic yards to recover 20,524 ounces of fine gold during the nine-month period ended February 28, 1958. In the same period of 1957, the firm dredged 6,324,500 cubic yards to recover 39,501 ounces. One dredge and the sluicing equipment were operating in the 1958 period, as compared with two dredges and sluicing equipment in 1957.

REPUBLIC OF THE PHILIPPINES—There have been wide-spread rumors of an extensive titanium strike on southern Luzon. Confirmation had not been made at this writing.

WESTERN AUSTRALIA—The first shipment of Western Australian ilmenite was made to the United States in Febru-

ary when 10,000 tons were shipped by Western Titanium N.L. Main participating groups in Western Titanium are Commonwealth Mining Investments Ltd. and Aberfoyle Tin N.L. The beach sand property is located at Capel.

REPUBLIC OF THE PHILIPPINES—The private landing air strip of Philippine Iron Mines in Larap, Camarines Norte, has been opened for commercial aircraft operations. The Civil Aeronautics Administration has issued an airport rating and permit. The company will extend the runway to accommodate DC-3 operations.

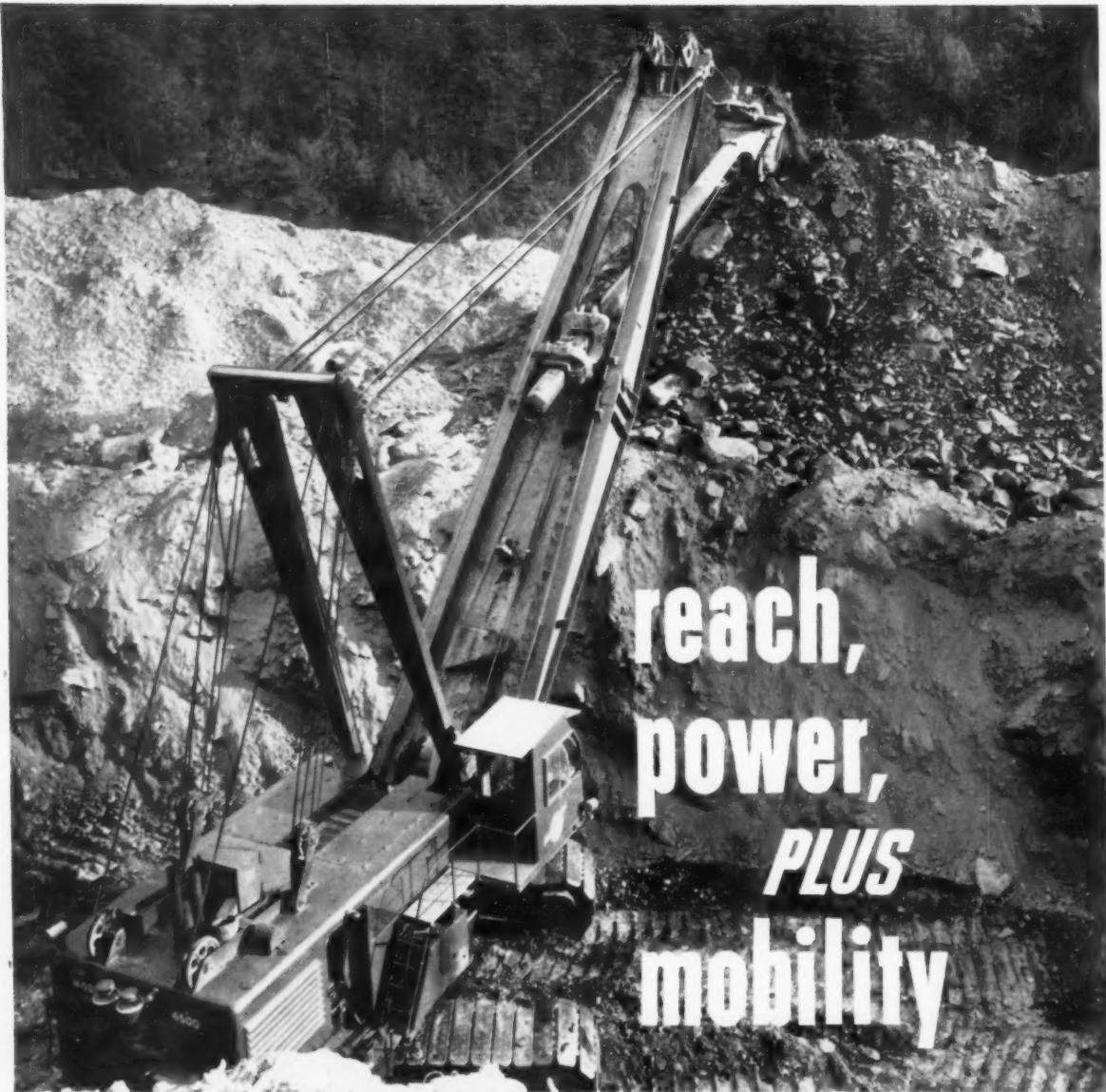
PACIFIC AREA—The Australian Bureau of Mineral Resources is planning an extensive search for phosphate deposits in Australia and its territories. The New Zealand government will undertake a similar survey. It is hoped to include many South Pacific islands which are under British control. Within the Australian Commonwealth, it is expected that three years will be spent on phosphate search, the beginning of which will take place in islands off the Northern Territory coast. Present Australian requirements of about 1,300,000 tons per annum come mainly from Nauru, Ocean Island, and Christmas Island.

QUEENSLAND—Mount Isa Mines Ltd. has completed a new dam on the Leichhardt River, and has recently built a new research laboratory and assay laboratory. A new power station, coal burning, should be finished by the end of 1960. (No further comments have been made about nuclear power for the area) The company is pushing ahead with all stages of its development programs and has not cut production. Financing for completion of the subsidiary Copper Refineries Pty.'s refinery at Townsville has been obtained. The cost of rehabilitating the Mount Isa-Townsville railway has been estimated by United States engineers at £29,000,000. This includes work on the present track, new bridges, locomotives, and rolling stock. An immediate start is needed to fit the line for additional heavy work in 1961 when the Mount Isa Mines expansion program is complete and *Mary Kathleen Uranium Ltd.* is in full production.



INDIA—The government has approved a proposal by Birla Brothers of New Delhi for the construction of an aluminum plant in the United Provinces. Hydroelectric power from the Rairihand Dam project now under construction would be used for the plant which will have a 10,000-ton-per-annum capacity. Bauxite deposits from the Amarkantak Range and Katni will supply the operation. A new 40-mile railway line will be constructed to transport the ore and the finished material. Kaiser Aluminum & Chemical Corporation of the United States will participate in the project.

CYPRUS—Hellenic Mining Company, Ltd. has undertaken a comparatively large project for an up-to-date ship loading installation at Morphou Bay on the North Coast to handle pyrite and other concentrates. The contract, reported to be worth nearly £1,000,000, has been



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awarded to a German firm with some of the machinery coming from the United Kingdom.

JAPAN—Japan has discovered uranium ore in Antarctica, according to Dr. Tatsuo Aichi, a member of the Japanese team which recently returned from Ongul Island. The ore is said to be pitchblende with a 40 to 50 percent uranium content.

TURKEY—A group of businessmen from Istanbul are reported to be seeking United States financing for an electrolytic copper plant in Turkey. The proposed plant would have an annual capacity of 6,000 tons of blister copper, and would also recover gold and silver. Turkey presently consumes about 12,000 tons annually with no electrolytic copper produced domestically.

MALAYA—Official figures are said to show that 92 tin mines and eight dredges have closed down in northern Malaya since the introduction of the International tin production restrictions in December 1957, and 3,600 tin workers have been dismissed. Prior to this there were 456 tin mines and 41 dredges at work, and 21,774 workers employed in mining operations in northern Malaya. Many of the mines currently working are on an eight-hour day and only working certain days of the week.

KOREA—The German *Demag Company* is reported to have proposed a \$5,000,000 plan for development of underground resources in connection with construction of the Naju fertilizer plant. The Ministry of Commerce & Industry is reviewing the plan. It is said that it was previously agreed in principle among the Ministries of Commerce & Industry, Finance, Foreign Affairs, and the Banks of Korea and Reconstruction to import and install facilities with the \$5,000,000 in three years, and to repay the investment within six years after the complete installation of the facilities. In addition to the \$5,000,000, HW1,600,000 and HW1,200,000,000 are required for the installation and operation of the facilities, respectively. It has also been decided to develop the Yangyang iron mine to produce 480,000 tons of iron ore annually; select either the Kumsong or Sudong nickel mine for production of 36,000 tons of nickel ore annually; select one of the four monazite mines including the Miho monazite mine to produce annually; develop the Sihung graphite mine to produce 150,000 tons of crystalline graphite annually; select another type of mine for development; construct a refinery capable of processing the various types of ores.

MALAYA—Chinese miners have been quite concerned about the number of applications coming into the Department of Mines to open new mine operations. These mines have not been in production for some time and therefore have not received a quota under the International Tin Agreement. Those already producing feel that as more mines reopen it will be inevitable that individual quotas be reduced still more. It is generally believed that many of the reopened mines, if given a certificate of production, will form groups to pool their quotas. They will then work some of the mines in the group, but others will remain idle.

TURKEY—Interest in boron salt deposits in western Turkey continues high. The *Turkish Institute for Mineral Resources Development* (MTA) is exploring a 2,000,000-ton deposit near Emet in the

province of Kutahya. First discoveries were made in 1952-1955 at Bigadic and Kestelec.

INDIA—The *Geological Survey of India* is carrying out investigations to trace the copper lode areas in Surda, Bhatia, and Kekha mines in Behar.

THAILAND—Leaders of the *Thailand Steel Company* are seeking Japanese technical assistance in construction of a steel plant in the Shajenizao area near Bangkok. Iron ore deposits in the area total at least 3,000,000 tons of high-grade containing 65 to 68 percent iron, according to all reports. The company is anxious to start producing steel in the area within six years, and hopes to repay the Japanese in shipments of iron ore.

INDIA—Exports of all grades of mica, including blocks, and splittings, and scraps, amounted to 20,607 tons during 1957, valued at Rupees 8,62 crores. The United States government has announced that future purchases of mica from India will be at an adjusted price increase of about 20 percent on weighted average. The price of Indian mica thus will be on a par with that of Brazilian mica. India supplies about 80 percent of the world's requirements of good quality mica and about 90 percent of the world's needs for mecanite. The U.S. purchases about 70 percent.



CHILE—A \$6,060,000 order for a copper smelting plant has been awarded by the Chilean State-owned *Empresa*

Nacional de Fundiciones to a German group headed by *Klockner Industrie A.G.* of Duisburg. Other members are *Demag*, *Siemens*, and *Klockner-Humboldt-Deutz* of Cologne. The plant, designed for an initial output of 30,000 tons of 98.0 to 98.5 percent blister copper per year, will be built near Quintero. Eventually capacity is planned for 80,000 tons of blister annually. A 10-year credit at 8.0 percent is being arranged with the Chilean *Banco do Estado* for half of the purchase price, and German suppliers will finance most of the remainder.

BOLIVIA—*Natomas Company* of California, through a newly acquired subsidiary, is exploring gold concessions along the Mapiri, Kaka, and Guanay rivers in Bolivia. The company acquired a two-thirds controlling interest in *Bolivian Mining Corporation* of Nevada in December of 1957 which included claims on about 23,000 acres in the watersheds of these rivers and an additional 43,000 acres in the same region.

PERU—*Marcona Mining Corporation* has started shipments of iron ore from its mines to the Chimbote steel plant of *Corporación Peruana del Santa* 250 miles north of Lima. The latter's new steel plant is just going into large-scale production. Marcona Mining Company signed an agreement with *Corporación Peruana* in 1952 for development of the Marcona iron deposits about 250 miles south of Lima. Part of the agreement was that shipments would be made to Chimbote when desired by the Peruvian firm. Shipments of Marcona ore to foreign markets started in 1955.

CHILE—*Kennebott Copper Corporation*'s Chilean subsidiary, *Braden Copper Company*, has reduced copper output by about 4,000 tons monthly during the winter season. Production has been cut



Oxide Copper Leaching Plant Opens in Israel

Israel Mining Industries, Ltd.'s new copper precipitation plant located at Timna, 15 miles from the Red Sea port of Eilat, recently began operations. The plant is designed to treat copper ore, averaging 1.5 percent Cu, at the rate of 1,590 tons per day. The entire operation is shown in the photograph above. Ore is mined from the open pit shown in the upper left corner, where a series of benches have been developed, and transported by truck to the primary crusher shown at the extreme right. The ore is carried by conveyor to the coarse ore storage pile, under the round bin; passes through the fine crushing plant in the center, and then to five circular thickener-type leaching vats. The plant to make sulphuric acid is located just beyond the round bin and at the extreme left is the cement copper precipitation launder. The deposit has known ore reserves of 12,000,000 tons, and drilling had indicated an additional 50,000,000 tons may be available.

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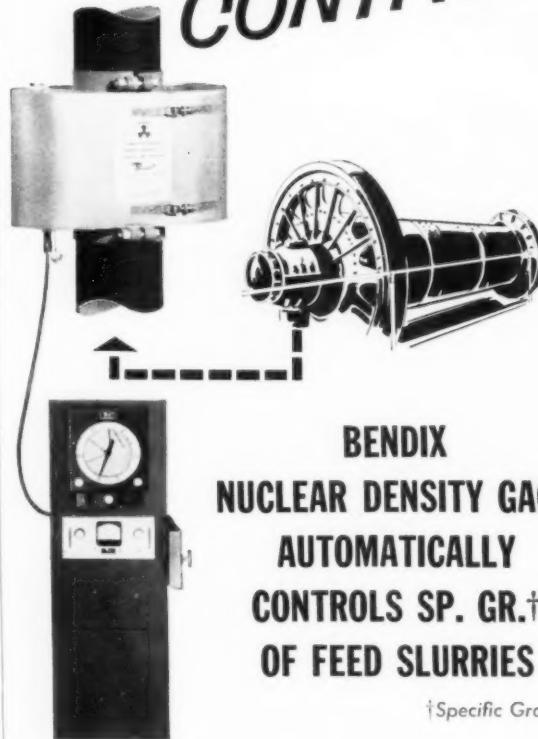
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from 17,000 tons to 13,000 tons. This is an annual occurrence brought about by winter conditions in Chile which cause a decrease in the flow of water to the company's hydro-electric power plants, with consequent limits in power output and plant operations, say company officials. The decreased output is generally in effect for about six months.

CUBA—Six major United States steel and automobile companies have invested \$25,250,000 in *Freeport Sulphur Company's* Cuban nickel project at Moa Bay. The companies have also entered into contracts with *Cuban American Nickel Company* for the purchase of substantial amounts of nickel from the project when production starts in the summer of 1959. Although the names have not been revealed, *McLouth Steel Corporation* has disclosed in its annual report that it is a participant in the arrangement.

NICARAGUA—*La Luz Mines Ltd.* expects its *Rosita* copper-gold project to go into production in October or November of this year. A plant is being installed, and a 100-mile road to tidewater has been completed. This road will also serve the *Siuna* gold property. A pier on the ocean near the mouth of Princapolka River is under construction. The *Rosita* property contains an estimated 3,582,000 tons averaging 2.91 percent copper and 0.027 ounces gold.

MEXICO—The *Perpetua Socorro* gold mine in the Municipality of Zacatlan, state of Puebla, has gone into production. The ore will be concentrated in a new flotation mill which is also in operation. Owner is Alfredo Mena Maceiso.

CHILE—*Cerro de Pasco Corporation* is seeking another extension of its option on the *Rio Blanco* property 32 miles northeast of Santiago where exploratory drilling has indicated 96,000,000 short tons of ore with an average grade of 1.6 percent copper. The present option, which was renewed once, now expires in October 1958. Engineering studies are being made and a preliminary mining plan is to be completed before the end of the year. Extensive surface rights adjoining the *Rio Blanco* ore body were acquired in 1957.

MEXICO—*Houc Sound Company* has been exploring old workings in the *El Potosi* lead and zinc mine in Chihuahua in a search for ore occurrences or extensions. The mine continued to operate at a small profit last year, despite the drop in lead and zinc prices, but an effort is being made to improve the reserves. A similar search is being made in the *El Carmen* copper mine at Batopilas, Chihuahua, to offset the decrease in the meager reserves. This mine produces copper concentrate with gold values, and suffered by the drastic drop in copper prices last year.

BRAZIL—A 12,000-ton-per-year lead smelter is expected to go into operation later this year at Santa Amaro, near Sao Paulo. Another lead plant with an annual output of 8,400 tons is being completed at *Nova Iguaçu* in the state of Rio de Janeiro. Production next year is expected to total around 20,000 tons which will be close to the level of consumption. In 1956 production was 4,298 tons, and imports amounted to 10,363 tons.

BOLIVIA—The country's only operating lead smelter, *Metabol*, increased production last year. It also decided to produce only lead bullion and did away with its silver refining.

BRAZIL—*Kennecott Copper Corporation* has organized a new exploration subsidiary in Brazil called *Kenanda Pesquisas Minerais, S.A.*

PERU—Because of the discovery of uranium ore in La Convencion Province, Department of Cuzco, the government has restricted mineral filing and declares that no further mining claims will be granted in the province.

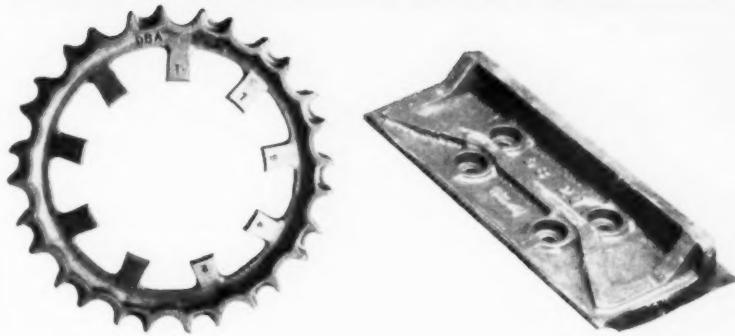
BRAZIL—According to the Departamento Nacional da Producao Mineral, rich deposits of monazite sand were found recently in the state of Piaui near the mouth of the Parnaiba River, and in the state of Maranhao near the Tutoia Bay. Both deposits are said to be easily work-

able. The contents of ilmenite and zircon vary widely.



NORWAY—*Mosjøen Aluminium A/S* has begun full production from its new plant in northern Norway, with initial output of 22,000 tons a year. The plant, which is a joint venture of *Elektrokemisk A/S* and the Swiss firm, *Aluminium In-*

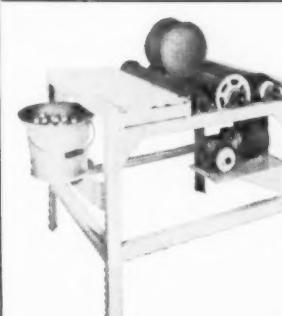
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dustrie AG (AlAG), has 112 electric furnaces in operation at the present time and 16 more will be installed to increase annual production to 25,000 tons. If additional power can be obtained from the state-owned Rossaga hydro-electric plant, production may reach 30,000 tons per year. Sale of most of the aluminum to be produced in the next several years has been assured through agreements with AlAG and other foreign companies.

GERMANY—*Duisburger Kupferhuette* recently began production from its zinc smelting plant constructed near the company's copper works at Duisburg. Rate of production is expected to reach 1,000 tons of zinc annually. The company will use byproduct zinc oxide as raw material. In the past this raw material had been delivered to other firms to be processed into metal.

SPAIN—*Cia. Siderurgica del Sur* has applied for permission to erect an atomic power plant near Puerto Santa Maria in southern Spain. The proposed capacity of the plant is 132,000 kilowatts and the financial investment is expected to be approximately 1,500,000,000 pesetas. Power production will be used by *Cia. Siderurgica del sur* and *Cia. Portland del Sur*.

WEST GERMANY—As a result of the recent decline in demand for West German steel, the *August Thyssen* steel combine will cut crude steel output by approximately 20 percent. Earlier this year, the *Hoesch* combine announced a reduction of 10 percent. The amount of unfilled orders early in 1958 had decreased more than 1,000,000 tons from the amount

in 1957. At the same time, East Germany has placed a growing number of orders for steel in western European countries. The reason for this is the East-West German Barter Agreement, which forces West German prices higher than export prices paid to other western European countries. Negotiations have begun to set a new procedure which would allow West German steel suppliers to sell at export prices to East Germany.

SPAIN—An iron ore deposit has been discovered at Aldearodrigo, about four miles from Zamora in northwest Spain, and further exploration is underway. The deposit is covered by a thin layer of sand, and reserves of several million tons of ore with an iron content of 55 percent have been indicated.

NORWAY—A new \$200,000,000 barter contract has been made between *Aardal og Sunndal Verk* and *Aluminum Ltd.* of Canada. Under the new contract, Aluminum Ltd. will ship Aardal 1,720,000 tons of alumina over a period of 20 years in exchange for aluminum ingot. Other existing barter contracts with Aardal were extended for approximately 15 years, covering an additional 1,984,000 tons of alumina. At current market prices, the \$200,000,000 received for the total 3,700,000 tons of alumina would buy 2,000,000 tons of aluminum; however, this price tag will vary with changes in metal prices in the future. The 185,000-ton average annual alumina shipment to Norway would be enough to produce about 92,500 tons of aluminum ingot.

FINLAND—A new company, *Ab Perno Oy*, has been established to develop

uranium deposits located in southern Finland. Ore reserves of the deposit are not known, but one ton of ore is expected to produce approximately 10 to 12 pounds of uranium. It is believed the new firm may be affiliated with *Atomenergia Inc.*, a company formed by Finnish paper and electrical power concerns to develop atomic power in Finland. Atomenergia plans to construct a uranium processing mill, which is scheduled to begin production by the end of 1959. The uranium oxide will be exchanged for enriched uranium and nuclear plant equipment, or for foreign currency to purchase equipment.

SARDINA—A new zinc refinery with a capacity of 15,000 tons of electrolytic zinc and 8,000 tons of sulphuric acid per year will be constructed in Sardinia, according to a recent announcement by Industry Commissioner G. Costa. The new plant, when completed, will employ approximately 400 people.

SPAIN—*Cia. Industrial Asturiana Santa Barbara* has begun operating a new blast furnace and iron ore production has been tripled. Production from the old furnace will be temporarily halted while repairs are made. When full production is resumed, the company hopes to increase output to five times as much as present production.

GREECE—Uranium deposits in workable quantities have been discovered in five areas along the Greek-Bulgarian border in northern Greece. Bodossakis Athanassiadis, Greek armaments and industrial magnate who reportedly financed the exploration program, announced that

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October 20 to 23. The Seventh NATIONAL CLAY CONFERENCE, National Museum in the Natural History Building of the Smithsonian Institute, Washington, D. C.

October 23, 24, and 25. Society of Mining Engineers, AIME, MID-AMERICA MINERALS CONFERENCE, Chase-Park and plaza Hotels, St. Louis, Missouri.

the deposits would be turned over to the government for further development.



AFRICA

SIERRA LEONE—First aerial exploration of a new area in West Africa in nearing completion. These airborne geophysical studies, which will have mapped a 4,000-square-mile area, were undertaken for the Sierra Leone Department of Overseas Geological Surveys by the Canadian Aerial Service Ltd. Base for the first phase of the survey was Lungi Airport near Freetown; the crew then moved on to Bo Airfield to complete the survey on the southern area of the country. Mineral resources sought include iron, diamonds, and low-grade chromite. Maps will be delivered to the Geological Survey this summer.

GHANA—*Ashanti Goldfields Corporation Ltd.* has decided to extend the treatment plant to provide for cyanide retreatment of flotation tailing. This would cost £175,000 and should result in improving recovery by about four percent. All excavation and foundation work has been completed and plant erection will start in August. Production is expected to start by the end of 1958.

UNION OF SOUTH AFRICA—*Buffelsfontein Gold Mining Company Ltd.* has nearly completed extensions to its gold plant to a rated capacity of 150,000 tons a month. The construction of the concrete headframe at the ventilation component of the Pioneer Shaft System, the installation there of a new 5,200-horsepower hoist, and the cutting of underground loading facilities are in progress. These additional facilities will increase the system's hoisting capacity.

BECHUANALAND—Diamond prospecting in the territory is continuing. Additional equipment has been acquired and facilities for easier transportation have been provided.

FEDERATION OF RHODESIA & NYASALAND—*N'Changa Consolidated Mines* at Chingola is now milling highly oxidized copper ores from its two open pits, in addition to the mixed oxide-sulfide ore from the underground workings.

UNION OF SOUTH AFRICA—*Stilfontein Gold Mining Company Ltd.* is extending its gold plant capacity to a rated 156,000 tons a month, compared with the average of about 108,000 tons handled in the first quarter. The Margaret shaft is being deepened, and the cutting of stations, loading bins, and pump stations is proceeding. Surface work includes the installation of a Koepe hoist.

GHANA—*Bibiana (1927) Ltd.* will explore the Main Reef zones to the north and south of the Central Shaft on the two lowest levels of its mine, as well as at the northern end. High priority is being given to this work, and it is hoped that the necessary development will be completed during the next 12 to 18 months. A characteristic feature of the ore bodies now being developed on and below the 19th level is that they are relatively small but of much higher grade than the average grade of the ore reserves.

SIERRA LEONE—The major exploration program of the *Tonkolili* iron ore de-

posits being undertaken by *Sierra Leone Development Company* is almost completed. The project is estimated to cost about \$60,000,000. Designing of the mine layout is being handled by a well known firm of United States consultants. Construction of additional storage space for concentrates at the ore loading port of Pepel will be finished late in 1958. Increased repair and maintenance facilities are being installed at Pepel and when complete all main line rolling stock maintenance and control of the railway will be handled from Pepel. At Marappa, where 1957 iron ore shipments were a record at about 1,500,000 tons, lump ore is nearly exhausted and present indications are that production will cease in early 1959. Provision of the reserves of powder ore will be

completed in 1958. A substantial tonnage is predicted and construction of a second mill to beneficiate the powder ore is underway. This new mill is designed to produce 500,000 tons of concentrate annually, and is to go into operation later this year.

FRENCH WEST AFRICA—*Miferna (Societe de Fer de Mauritanie)* is at present negotiating with Spanish authorities for permission to build a railroad through the Spanish controlled western Sahara district of Rio de Oro. Miferna is developing large iron ore reserves near Fort Gouraud in Mauritania, and intends to ship the ore to Port Etienne on the Atlantic coast. To by-pass Spanish territory means construction of a 700-kilometer railroad at a cost of about \$125,000,000. Spain is being

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AB	42"	850#	3D	60"	2865#
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asked to agree on a plant to build the railroad through Rio de Oro, thus shortening the distance by 300 kilometers and cutting expected construction costs to about \$65,000,000. The railroad would then reach the coast at Villa Cisneros, rather than Port Etienne.

UNION OF SOUTH AFRICA—Rand London Corporation Ltd. is the new name of South West Graphite Mining and Refining Company, which some time ago suspended operations in South West Africa and passed to new control. The firm has secured participations in mineral operations over about 14,898 acres in the Kinnross area held by the Anglo American group, over about 73,666 acres northeast of the Hartebeestfontein Buffelsfontein mines held by Middle Witwatersrand (Western Areas) Ltd. in the Klerksdorp area, and a substantial shareholding in the West Vlakfontein company. Drilling is in progress in the Klerksdorp option area where, in other zones, prospecting interest on the part of other mining companies has been unofficially reported as increasing.

MOZAMBIQUE—Witwatersrand Brick and Tile Company has embarked on a program of extending its activities. It has purchased the controlling interest in Minerais Basicos de Mocambique Limitada, which owns concessions at the mouth of Pebane River in Mozambique, including a high-grade titanium deposit, and to which an interest-free loan of £40,000 has been advanced. In turn, Abbey Minerals Ltd. of London has acquired from Witwatersrand Brick half of the latter's interest in the Mozambique company, to which it has advanced an interest-free loan of £100,000. Production of titanium concentrates is expected to be initiated in the near future. Witwatersrand Brick has also acquired a 50 percent interest in Springbok Industrial and Mineral Ventures (Pty) Ltd. which owns a lease over a large, high-grade iron ore deposit not far from the Postansburg Station in the Union of South Africa.

SOUTH WEST AFRICA—Diamond Dredging and Mining Company (S.W.A.) Ltd., recently formed, has acquired a grant to prospect and mine for all minerals over a 10-year period in a strip about 180 miles long from south of Walvis Bay to north of Luderitz, and of a width three miles seaward from the high-water mark. This strip is on the seaward side of Diamond Area No. 2 in which pegging, prospecting, and mining is the exclusive right of Industrial Diamonds of South Africa (1945) Ltd. and the associated Diamond Mining and Utility Company. Diamond Dredging also acquired a subsidiary, Moly-Copper Mining and Exploration Company (SWA) which holds 200,000 of the 600,000 issued shares in Lorelei Copper Mines. The latter holds the mining rights over 310 base metal claims on the north bank of the Orange River in the Luderitz district immediately east of Diamond Area No. 1, where the rights are owned by Consolidated Diamond Mines of S.W.A. which also owns the prior rights in respect of Diamond Area No. 2. The Lorelei company has located several bodies of copper and molybdenum ore in its claim area, and plans an extension of prospecting operations for the latter. Small-scale operations and production of copper concentrates (also containing silver, gold, and molybdenum) was suspended last year due to the metal market conditions. The Moly-Copper company has also acquired a

prospecting grant over about 1,500 square miles, adjacent to the Lorelei holdings.

UNION OF SOUTH AFRICA—South Africa Minerals has closed down its chrome mine which is in the Rustenburg area of Transvaal. It produced 5,794 long tons of ore during the last quarter of 1957. The step was taken by the company's management because of the poor market for chrome.

FEDERATION OF RHODESIA & NYASALAND—In spite of the present depressed conditions of the copper market, Mufulira Copper Mines Ltd. will go ahead with the Mufulira West project which, when completed, will greatly increase the mine's capacity. A recent achievement at Mufulira West was the erection of a £28,000 132-foot concrete headgear at the No. 2 Prain service shaft, which was put up in 2½ hours under 11 days.



NORTH AMERICA

NEWFOUNDLAND—Wabush Iron Company, owned by Pickards Mather & Co., The Steel Company of Canada, Youngstown Sheet and Tube Company, and Interlake Iron Corporation, has assumed control of the Newfoundland and Labrador Corporation (NALCO). The latter has mineral and timber concessions from the government of Newfoundland

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for over 24,000 square miles in Labrador and on the Island of Newfoundland. An iron ore deposit in one section of the concession area is already under exploration and initial development.

ONTARIO—Canadian *Dyno Mines, Ltd.*, operating in the Bancroft area, has placed its new 1,100-ton uranium mill in operation at an initial rate of 550 to 600 tons per day. The plant uses the acid leach-ion exchange system. Initial mill feed is coming from surface stockpiles of ore and from the "B" zone which is the most extensively developed at the mine. It has been developed on the first three levels and is under exploration on the 4th and 5th levels. First shipments of uranium precipitate should be made to the refinery at Port Hope, Ontario later this month.

SASKATCHEWAN—Latest firm in the potash field of Saskatchewan is *Winsal of Canada*, subsidiary of *Castrop-Rauxel* of West Germany. The company has purchased two parcels of potash subsurface withdrawals located in the Melville and Yorkton districts. *Potash Company of America's* new 3,300-foot production shaft is about ready for operation at Patience Lake. When in full operation it will be mining at a rate of 4,000 tons per day. *International Minerals & Chemical Corporation* is developing a property at Esterhazy which should be ready for production in late 1959 or early 1960.

ALASKA—The Yakobi Island nickel deposits are being drilled by *Devamin Company Inc.*, this season. Several drilling crews will be assigned to the property. The island is located at the north west end of Chichagof Island. Its extensive nickel deposits were under litigation for a number of years.

QUEBEC—The Canadian patent on the Riddell Shaft Mucker, which is also patented in the United States, has been upheld in a recent decision of the Exchequer Court of Canada. An injunction and damages for patent infringement were awarded against *Patrick Harrison and Company Ltd.* of Noranda. The patents have been widely licensed by the plaintiff in the action, J. Murray Riddell, consulting mining engineer of Houghton, Michigan.

BRITISH COLUMBIA—At the old *Phoenix* copper mine near Greenwood, *Granby Consolidated Mining, Smelting and Power Company, Ltd.* has a small crew installing machinery in a new 700-ton concentrator in order that the plant can be placed in production quickly should the price of copper improve. Nearly 5,000 tons of ore has been stockpiled in stripping 54,000 tons of waste from the top of the ore body.

NEW BRUNSWICK—*Conway Exploration Company Ltd.* will explore four claim groups in northern New Brunswick this season. The firm worked in the area last season, too, without any great success. In northwestern Quebec, the firm staked a large group of claims north of the main discovery of *Mattagami Syndicate* in the Mattagami Lake area. These will be investigated this season, also.

ONTARIO—*International Ranwick Ltd.* has decided to proceed with bringing *Min-Ore Mines' property* to a production basis in the Matachewan area of northern Ontario. The company has been drilling and sampling the property which was a former copper producer. There is a 480-foot shaft with four levels, a copper concentrator, and auxiliary plant and buildings. The flowsheet of the plant

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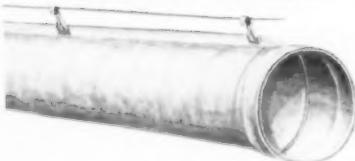
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will be revamped for production of molybdenite concentrates. Copper concentrates will also be produced for shipment to the Noranda smelter. Assaying suggests some 25,000 to 30,000 tons of ore is available from current workings with a grade expected to average above 0.5 percent molybdenum and 1.25 percent copper.

QUEBEC—New York-Alaska Gold Dredging Corporation, long experienced in gold placer operations, has entered the Chaudiere Valley region through participation in Beauce Placer Mining Company. Initial efforts are being concentrated along the Gilbert River where some drilling is going on. Some of the other streams in the area will be explored later. Hedley A. Rose is in charge of all drilling operations.

MANITOBA—Continental Consolidated Mines & Oils Corporation has completed its survey of the nickel property in the Mystery-Moak Lake area. Further development of this group of claims depends upon the company engineer's recommendations. Comoco is also drilling on its iron property in Boston Township of Ontario, and plans diamond drilling on a gold property in the Northwest Territories soon after "break-up."

ALASKA—United States Smelting Refining and Mining Company reports that the future of operations at Fairbanks and Nome will depend to a large extent upon costs, but it is expected by the firm's management that they will not continue beyond 1963 or 1964. When the shutdown occurs, most of the dredgeable ground at Fairbanks will have been exhausted but substantial areas of marginal ground will remain at Nome which might become profitable at a higher gold price. It is planned to hold the mining property so that operations can be resumed at some future date if conditions justify it.

BRITISH COLUMBIA—Reeves MacDonnell Mines, Ltd. at last report was continuing to operate its zinc-lead-silver-cadmium mine in the Salmo district at capacity of about 35,000 tons of ore monthly despite sharply reduced earnings brought about by low metal prices. The mine shaft has been extended 500 feet to a slope distance of 1,065 feet below the main haulage level. Continuation of the main ore body to below the present deepest working level has been proven by drilling.

NORTHWEST TERRITORIES—Consolidated Discovery Yellowknife Mines Ltd. will deepen its shaft to 3,200 feet and establish three new levels this year. Work has already started. According to President J. C. Byrne, width of the ore structure has decreased below the 2,150-foot level because of a steepening dip and this condition is expected to persist to the present bottom level at 2,750 feet. Proved ore reserves have been maintained at three years supply, with grade practically unchanged because of continuing high grade ore at depth. March production of 8,445 ounces of gold valued at \$297,000 was an all-time high. This output came from 12 stope scattered throughout the mine, with an appreciable amount from the lower levels. The mill treated 134 tons daily, averaging 2.04 ounces.

NOVA SCOTIA—Canadian Alumina Corporation Ltd. reports that a pilot plant is testing the economic feasibility of an acid leaching process for the extraction of aluminum from the firm's

holdings of aluminiferous slates in Guysborough County. The pilot plant tests are being conducted in the laboratories of the Department of Mines and Technical Surveys by the Department officials and Amco Technical Consultants. The company's holdings are on Chedabucto Bay within a mile of the Atlantic Ocean, which provides water transportation to Quebec for export.

MANITOBA—Hudson's Bay Mining & Smelting Company is proceeding with shaft sinking on its new Chisel Lake zinc and Stall Lake copper ore bodies some 70 miles east of the firm's Flin Flon operations. Shaft sinking on these properties was actually started last year. Tentative plans now call for sinking the Chisel Lake to 1,000 feet with some laterals underground, while Stall Lake would be sunk to the 2,000-foot level and also would have lateral work done this year.

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It is hoped that the Chisel Lake operation will get under way by summer 1960.

ONTARIO—Production has been delayed at the new Moose Mountain mine of *Louphos Ores Inc.*, near Sudbury because of lower demand for iron ore. Plant construction is nearly completed, and the company will continue to strip overburden from the mine site. The operation will be ready to move into production quickly when conditions are suitable. It will have a capacity of 550,000 tons of concentrates annually.

QUEBEC—James R. Yates and associates have staked about 5,640 acres covering Lake Normand and the surrounding beaches. After discovering a large deposit of iron sands at the lake, Assays have shown between 55 and 71 percent iron in the sands. The property is about 120 miles north east of Montreal and about 90 miles north of Three Rivers on the St. Lawrence River. Some United States iron and steel firms are said to be interested in the property as a supplement to their iron ore deposits in Ungava and northern Quebec.

GREENLAND—Reports from Copenhagen, Denmark indicate that *Climax Molybdenum Company Division of American Metal Climax Inc.* is interested in exploring molybdenum deposits in East Greenland. It is said, however, that the Danish government has decided to provide the capital needed for exploration. The deposits are located in the concession area held by *Northern Mining Company*.

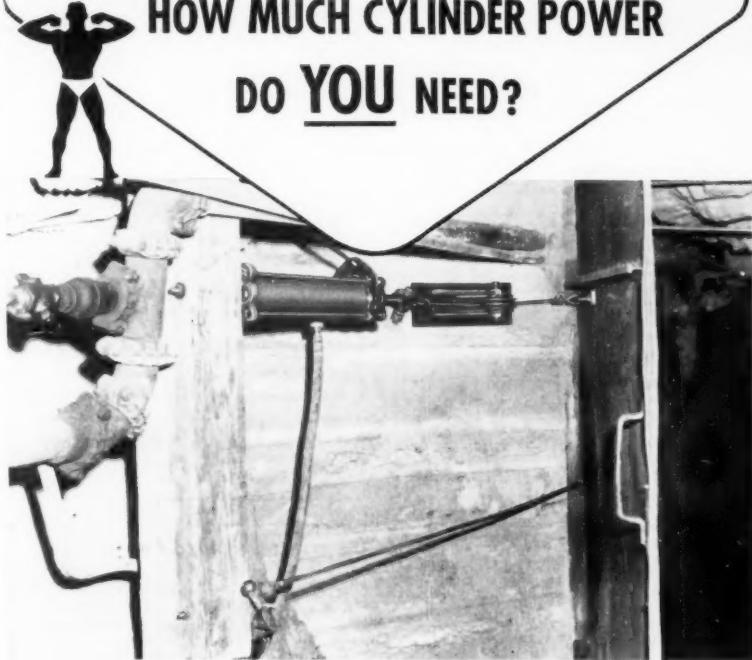
MANITOBA—*International Nickel Company of Canada* hopes to complete sinking of its 2,100-foot production shaft at the *Thompson* mine by the fall of this year. The 1,057-foot development shaft was completed earlier this year. Construction of surface facilities, including the mill and smelter, is on schedule.

QUEBEC—*Canadian British Aluminium Company* has brought its first development stage into production at its new aluminum plant at Baie Comeau. Stage 1 has a capacity of 40,000 long tons of ingot annually. Completion of stage 2 which will produce another 40,000 tons has been moved up to late this fall with full production in mid-1959. No decision has been made on stages 3 and 4 which would add another 80,000 long tons to annual capacity.

ONTARIO—*International Nickel Company of Canada* has cut its production another 10 percent, or about 1,000 tons a month. A similar reduction was made at the company's mines in Sudbury, Ontario in March. These cutbacks also reduce the amount of copper produced because the company's ores also contain copper. Inco, at its peak, had been producing over 150,000 tons of nickel annually, and 140,000 tons of copper annually. The firm declares, however, that its long-term plans to increase capacity are unchanged.

NEW BRUNSWICK—*American Metal Climax Inc.* has announced the temporary closing of the lead-zinc copper mine operated by *Heath Steele Mines Ltd.*, a 75 percent owned subsidiary of *American Metal Climax*. The mine was closed early in May to avoid depletion of ore reserves during current conditions of low prices. Break-in operations of the property were started early in 1957, but because of the depressed prices, the property was never brought up to its planned capacity of 1,500 tons of ore per day.

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2"	214	279	345	385	542	628	726	864	1,212	1,545	2,260
3"	337	435	535	602	852	962	1,082	1,252	1,734	2,176	3,020
4"	460	598	735	835	1,202	1,382	1,562	1,772	2,312	2,816	3,880
5"	583	752	912	1,032	1,502	1,712	1,932	2,172	2,752	3,352	4,520
6"	706	905	1,085	1,215	1,705	1,935	2,175	2,425	3,025	3,625	5,020
7"	829	1,052	1,252	1,402	1,902	2,152	2,422	2,702	3,322	3,922	5,420
8"	952	1,202	1,422	1,582	2,102	2,372	2,662	2,962	3,602	4,202	5,700
9"	1,075	1,352	1,602	1,772	2,352	2,652	2,972	3,292	3,952	4,552	6,150
10"	1,198	1,502	1,772	1,962	2,552	2,872	3,212	3,552	4,232	4,832	6,430
12"	1,648	2,052	2,422	2,652	3,352	3,772	4,152	4,552	5,252	6,052	7,650
14"	2,102	2,552	3,022	3,322	4,052	4,472	4,952	5,352	6,052	6,852	8,450
16"	2,552	3,052	3,622	3,922	4,652	5,072	5,552	6,052	6,752	7,552	9,150
18"	3,002	3,552	4,122	4,422	5,152	5,572	6,052	6,552	7,252	8,052	9,650
20"	3,452	4,052	4,622	4,922	5,652	6,072	6,552	7,052	7,752	8,552	10,150

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- 1—500 KW West. Syn. 275 V. 1200 RPM
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- 2—13 T. West. 250 V. 908-C, Mts. 42"-36" Ga.
- 4—8 T. Good. 250 V. 31-C, Mts. 36" Ga.
- 1—BT West. 250 V. 955-LK, Mts. 36"-30" Ga.
- 1—8 T. West. 250 V. 925-LK, Mts. 28"-24" Ga.
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10—#12 Deco, Wet

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1—3" Wemco Diaphragm, Simplex
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2—2" Wemco Sand, 5 HP Motor
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7—2"-3" ASH Hydroseal "A" Frame
11—4"-6" ASH Hydroseal "B" Frame
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PUMP, VACUUM

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SAMPLERS

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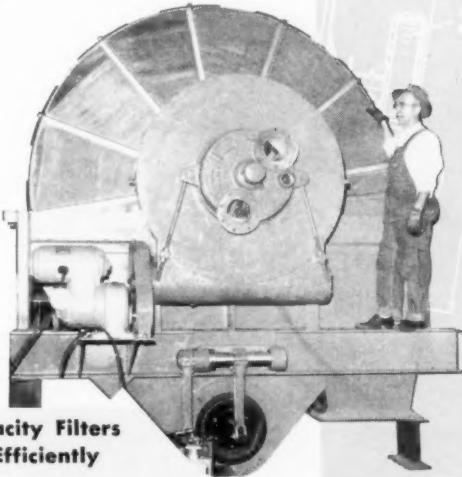
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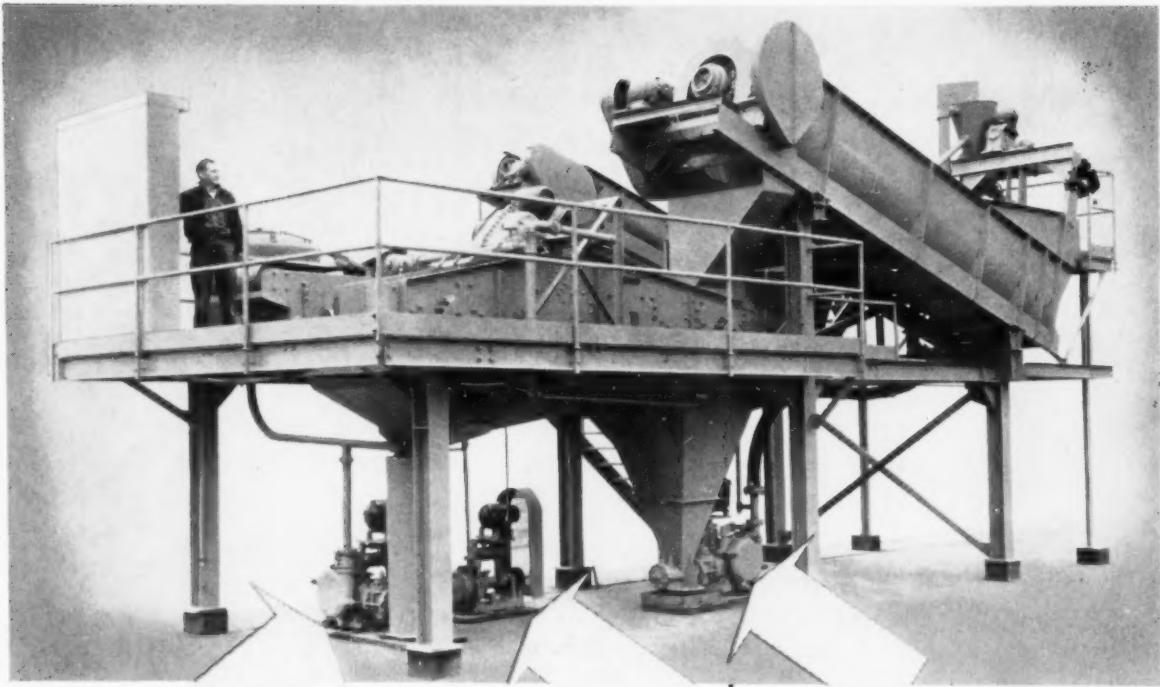
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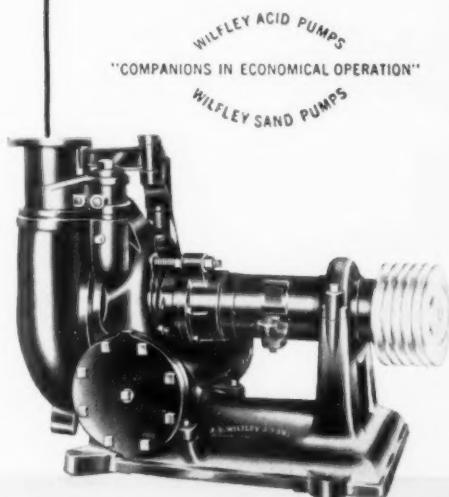


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